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The natives of Kharga Oasis, Egypt

Aleš Hrdlička



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SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 1

THE NATIVES OF KHARGA OASIS, EGYPT

WITH THIRTY-EIGHT PLATES



BY

DR. ALEŠ HRDLIČKA

Curator, Division of Physical Anthropology, U. S. National Museum



(PUBLICATION 2071)

CITY OF WASHINGTON
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KHARGA OASIS: THE VILLAGE OF KHARGA

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THE NATIVES OF THE KHARGA OASIS, EGYPT

By DR. ALEŠ HRDLIČKA

CURATOR, DIVISION OF PHYSICAL ANTHROPOLOGY, U. S. NATIONAL MUSEUM

(WITH THIRTY-EIGHT PLATES)

1. INTRODUCTION

For a number of years important and very careful archeological researches have been conducted in Egypt under the auspices of the Metropolitan Museum of Art, New York City. These researches have been carried on by Mr. A. M. Lythgoe, Curator of the Egyptian Department in the Metropolitan Museum, and his able assistants, Mr. A. C. Mace, and Mr. Herbert E. Winlock. They have extended, thus far, principally to certain pyramids and cemeteries of the XIIth Dynasty, and to the temple of Hibis as well as the large early Christian necropolis at the Great or Kharga (= Eastern) Oasis.

The dynastic monuments and cemeteries actually under exploration by the Expedition are those of Amenemhat I. and Usertesen I., the first two kings of the Middle Empire. They are situated on the western margin of the desert bordering the Nile valley, near the native town of Lisht, some thirty miles south of Cairo. The research is being directed in part toward the clearing of the great pyramid temples, and in part to the examination of what remains of the contents of the graves, particularly in the numerous and remarkable burial pits located about the more northern of the two pyramids.

The excavations have been attended from the beginning by the recovery of skeletal remains dating especially from the XIIth, but also from the XVIIIth to the XXIst Dynasties. In view of the fact that a large amount of this skeletal material could be definitely identified from a chronological standpoint, and because of the great scarcity of Egyptian skeletal remains in American collections, the writer endeavored to bring about a saving of such crania and bones for the U. S. National Museum, and eventually, due to the generosity of the authorities of the Metropolitan Museum and the aid of Mr. Lythgoe, an arrangement to that effect was perfected by the two Institutions. As a result of this arrangement, the National Museum is already in possession of more than three hundred well dated

Egyptian crania, with a large quantity of other osseous parts; and it is hoped that as the field work goes on, this collection will increase to important proportions and form a study and reference series unique on this continent, and of the highest scientific value.

The Metropolitan Museum's explorations at the Kharga Oasis resulted also in the unearthing of a considerable number of bodies, in this case proceeding from the Coptic burials of the second and third centuries A. D. This material is also destined for the U. S. National Museum. It comes mostly in the shape of natural mummies in a remarkably good state of preservation, and will be of especial value for comparisons and in the study of the entire skeletons. Some of the bones and mummies from the Oasis have already reached the National Museum, while another collection awaits transportation.

The co-operation of the two Institutions, however, soon developed the fact that for a more thorough understanding of the conditions, and also for the purpose of utilizing favorable local opportunities in the study of the living remnants of the Egyptians, particularly at the Great Oasis, a personal visit to the field by an anthropologist was desirable. Toward the end of 1908, the means provided for the Metropolitan Museum expedition rendering such a visit feasible, the writer was detailed by the National Museum for the journey. He spent ten weeks in Egypt, partly at Cairo, where, due to the courtesies of Prof. G. Elliot-Smith, he was able to study the skeletal remains from several important periods, especially the invaluable early pre-dynastic, Naga-el-Der, collection; partly at the Lisht excavations, where numerous XIIth Dynasty crania and other skeletal parts were collected; and partly at the Great Oasis, where, besides some work on the mummies and skeletal remains, measurements and observations were made on 150 of the living adult male inhabitants.

The present paper deals only with the last named investigations. The value of the studies on the Kharga Oasis natives lies in the fact that these people have received as yet no scientific attention; and that, due to their isolation, and their former adherence to the Copts, they may be regarded as purer representatives of the old inhabitants of that region than the people of many parts of the valley are of their more ancient predecessors. Moreover, results of the observations ought to prove of special interest medically, due to the isolation of the people and their peculiar environmental conditions.

The studies were restricted to individuals of normal (that is, non-pathological) development, who did not show by their hair or fea-

tures negro admixture. The selection on the last mentioned basis is of particular importance, for an inclusion of those who are visibly part negro would necessarily vitiate the outcome of the observations. Even with the precaution taken some individuals were doubtless included who were not free from negro blood, but the influence of such unrecognizable cases on the results must be small. The mixture with the negro at the Oasis is on the whole less extensive than in some parts of the valley. It is also in general more modern and more easily eliminated.

The women of the Oasis, regrettably, could not be studied, due to the restrictions of the Mohammedan religion.

2. GEOGRAPHICAL AND HISTORICAL NOTES ON THE GREAT OASIS

The Kharga Oasis lies¹ 130 miles west from Luxor, the ancient Thebes; the nearest point on the Nile, however, is less distant. For the last four years it has been connected with the Nile valley by a railroad; before that time it was reached only by from three to five days' journey across the desert with camels.

The Oasis is a great but shallow and flat depression, over 3,000 square kilometers in extent, in the Libyan Desert, which in these regions is absolutely barren. It extends roughly between the parallels of 26° to 24° north latitude and forms the eastern portion of an immense shallow natural excavation, the western part of which is the Western or Dakhla Oasis (fig. 1).

The Kharga Oasis has been peopled since early dynastic if not pre-dynastic times. It yields ancient stone implements, is mentioned in some of the oldest Egyptian records, and contains the remains of numerous old settlements as well as of several temples. It also has the best preserved Coptic necropolis.

At the present time, as probably always in the past, a great part of the Oasis depression is desert. The habitable portions are those that contain flowing, generally artificial wells. These parts, several in number, are separated by the sands and barrens and are the real oases in the great arid desert depression.

Each of these smaller or larger watered areas is represented by a village or town, the main of which, from north to south, are known as Kharga, Gennah, Boulac or Bulaq, and Beris. In addition there

¹ Following, in the main, J. Ball, "Kharga Oasis: its Topography and Geology." Geological Survey Report. Survey Department, Egypt, 1899; 8°. Cairo, 1900; and Beadnell, H. J. L.—An Egyptian Oasis, 8°, London, 1909.

are several settlements of minor importance, and a number of places that are occupied only for a time each year, during the growing or gathering of crops.

The total number of the present inhabitants of the Great Oasis, including some Bedouins, is somewhat less than 10,000. Their

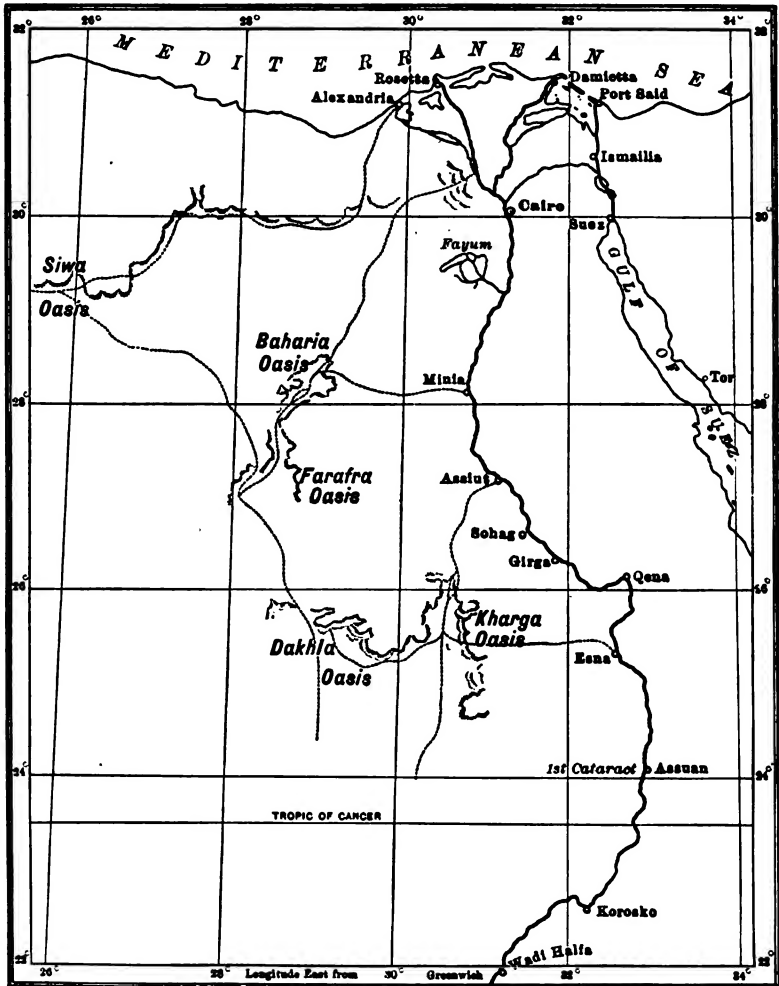


FIG. 1.—Sketch map of Egypt, showing the position of the oases. (After Ball.)

ethnic origin and the time of their immigration into the Oasis are both uncertain. The earliest record thus far discovered relating directly to the Oasis dates from the XIIth Dynasty, or a little less

than 2000 years B. C.¹ It narrates that "Ikudidi, a steward of Sesostri I., was dispatched by him to the great oasis of El Khargeh on the west of Abydos, whence the caravans started thither"; which would seem to indicate that the Oasis already formed a component part of upper Egypt and was in frequent communication with that country.

There is in existence, however, a much earlier and very suggestive record, which possibly implies a still more ancient suzerainty of Egypt over the southwestern settlement, and may contain a clew to the ethnic derivation of the early inhabitants of the Oasis. It dates from the reign of Mernere, of the 6th Dynasty, or from about 2500 years B. C., and speaks of a general of that king dispatched to the "distant Yam," which is identified by Egyptologists as a part of Nubia lying between the second and third cataracts.² Arriving in Yam, Harkhuf, the general in question, "found its chief engaged in a war with the southernmost settlements of the Temehu tribes, related to the Libyans, on the west of Yam. Harkhuf immediately went after him and had no difficulty in reducing him to subjection."³

If the tribes west of the Yam people were of the Temehu, related to the Libyans or Berbers, then it is quite probable that the Kharga Oasis people, dwelling approximately 300 miles more northward of the Yam country, in the Libyan desert and in the line of migration from the Libyan lands in the north, were of the same extraction. It is even possible that the mention referred directly to the southern Oasis (Kharga and Dakhla), in which case the record would also imply that the Oasis inhabitants were at that time subjects of Egypt and as such received protection.

As to references in foreign authors, Herodotus writes (Thalia) that the Persian troops of Cambyzes "who were sent against the Ammonians, leaving Thebes, followed their guides, and appear to have reached the city Oasis, which those Samians, who are said to be of the Aeschrionian tribe, inhabit, distant from Thebes seven days' journey across the sand." This can, it seems, refer only to the Great Oasis; but it is not clear who were meant by the Aeschrionians.

Edmonstone⁴ mentions a passage from *Josephus contra Apionem*,

¹ Breasted, J. H.: *Ancient Records of Egypt*, Vol. I, Chicago, 1905, pp. 524-528; *A History of Egypt*, 2d ed., 8° N. Y., 1909, p. 182.

² See map at the end of the volume in Breasted's *History of Egypt*, cited in the preceding foot-note.

³ Breasted, J. H.: *Ancient Records of Egypt*, Vol. I, pp. 333-336; *History of Egypt*, 1909, p. 138.

⁴ Edmonstone, A.: *A Journey to Two of the Oases of Upper Egypt*. 8°. London, 1822, pp. 133-134.

Lib. 2, which indicates that in the time of Josephus the population of those remote tracts was considered as pure Egyptian. In attacking Apion, Josephus accuses him of wishing to be considered a Greek, when he is an Egyptian, and says "He believes himself [a Greek], and that too, being born in the Oasis of Egypt whence he is, as one would say, the first of all Egyptians."

During the periods of the Persian, Greek, and Roman dominions of Egypt, the Oasis was evidently regarded as an inherent part of Egypt and its inhabitants as not differing from the Valley Egyptians. It suffered, as it probably did before, invasions of the more southern and more warlike tribes, which, however, did not result in colonization.

Edmonstone thus quotes (pp. 139-140)¹ two letters of the bishop Nestorius, referring to later times, particularly to destructive raids on the Oasis by the "Blemmyes" and other more southern tribes: "After the Oasis was, as I mentioned above, taken by the barbarian (Blemmyes), and completely laid waste and devastated by fire, they who, for what cause I know not, carried me off, suddenly took compassion and dismissed me, adding threats, however, if I did not instantly leave the country, for they said the Maziei were to take possession as soon as we left it." The Blemmyes, according to Strabo (Xylandri, L. 17, p. 786), were subject to the Ethiopians, and inhabited "both sides of the Nile, on the borders of Egypt, to which country, being a nomad race, they became very troublesome neighbors." These raids have in all probability repeatedly reduced the population of the Oasis, but did not alter its ethnic nature.

There are a few later records concerning Kharga, touching on its famous wines, on its tributes to Egypt, on its being used as a place of banishment (particularly during the early centuries of the Christian era) and on its temples, its Christians (Copts), and its garrisons,² but these contain nothing of anthropological interest except the indication of the affluence to the Oasis, through those who were banished thither and through the garrison personnel, of foreign

¹ From Evagrius, Hist. Ecl., Lib. I, cap. 5.

² The references apply in some of the cases to the oases in general. Thus, for instance, the "Notitia dignitatum," composed under the sons of Theodosius the Great and mentioned by Schweinfurth in his "Notizen zur Kenntniss der Oase El-Chargeh" (Petermann's Mittheilungen, 1875, p. 385), speaks of the garrisons of the oases as having been composed of Quades, Armenians and Ahasges. And when the Great Oasis is spoken of separately it doubtless includes mostly Dakhla as well as Kharga, for these were not always distinguished as two separate territories.

racial elements, some of which doubtless mixed or fused with the population,¹ but the total effect of these mixtures on the physical status of the Oasis people was probably only moderate. The inscriptions on the temple of Hibis, at Kharga, refer to the oases, according to Beadnell, under the comprehensive name "Set-ament," or "the Western Lands," without any further distinction or information.

The above is about all that can be said about the Oasis from the anthropological standpoint up to the time of the Arab invasion concerning which there are no details. After the coming of the Arabs, however, and the introduction of the camel, there followed the establishment, or more probably an increase in importance, of the Soudan-Assiout and other caravan routes, which lead across the Oasis. The Soudan route then became the artery of extensive black slave traffic and this introduced gradually into the Oasis a supply of Soudanese negro slaves, and influenced to an important degree the racial character of the natives. The slaves were obtained from the caravans in exchange for animals or goods, or as leavings in cases of sickness or accident, and were eventually embodied into the population. In the course of several hundred years, this negro admixture accumulated to such a degree that today nearly one-third of the inhabitants of the Oasis show more or less pronounced traces of negro admixture.

Some of the negro admixture is recent, or well remembered in the families, other admixture is older and more difficult to trace; but very nearly all is post-Coptic, for the mummies and bones recovered from the great Coptic necropolis present almost exclusively hair and features of a non-negroid character.

There doubtless also came into the Oasis in the course of time some settlers from the Nile valley. How strong the Arab and the Valley accessions may have been, particularly in periods of partial depopulation of the Oasis by epidemics or enemies, it is impossible to say, yet it is probable that not many were attracted to the isolated, exposed, initially quite unhealthful, and especially poor region, and that the bulk of the population maintained or renewed itself principally through natural augmentation.

3. RECENT DATA ON THE KHARGA OASIS PEOPLE

Modern references to the Egyptians of the Great Oasis are almost as scarce as those of the older times, and what there are, with one or two exceptions, touch only indirectly on the people themselves. The

¹ During the writer's examination a man was found whose family claims descent from a Roman soldier married to a native woman; and there are said to be several such cases in the Oasis.

literature is given in the bibliography. A few data of especial interest are as follows:

Browne, who passed through the Oasis in 1793,¹ mentions the acquiring by the inhabitants of Nubian negro slaves (p. 261): "When we came to Beiris we were met by a Cashef, who welcomed the Ielabs with an exhibition of fireworks; on this occasion he treats the chief merchants with coffee, and presents to each a benish of coarse cloth, worth about a guinea, expecting, however, in return a slave from each, worth at least ten guineas."

Quatremère,² in 1811, mentions a new devastation of the Great Oasis by the Blemmyes.

In 1835, the Kharga Oasis was visited by Hoskins, and in the description of his journey, published in 1837,³ the author says (p. 81): "The inhabitants of this town (Khargeh), and indeed of all the Oasis, have (with some exceptions), not such strongly marked features as the Arab of the Nile, and their complexion is lighter than that of the peasants of Egypt in the same latitude. But they are chiefly remarkable for the pallid and unhealthy hue of their countenances, just such a tint, or rather expression, allowing for the difference of color, as distinguishes the inhabitants of the Pontine marshes; a languid and sickly appearance; a listlessness in their manner; a sluggishness in their movements; a total want of energy and vivacity—all proofs of the insalubrity of the climate, and the wretched effects of a baneful malaria. This pallid hue is most remarkable in their children and women; the men, exposed to the influence of a tropical sun, have an appearance somewhat less unhealthy." On pp. 82-83 Hoskins mentions the presence at the Oasis of malaria and ophthalmia; on pp. 86-88 he says "the women are not obliged to cover their faces or live in the seclusion of harem"—conditions now quite changed. The women, he thinks (p. 87), with their "pale complexion" are better looking than those of the Valley and have more regular features. Finally, on page 89, he estimates the population of the whole Oasis at 4,300, of Kharga alone at 3,000.

Caillaud, Schweinfurth, Brugsch, Golenischeff, and Ball give valuable data on the archeology of the Kharga Oasis, and the last

¹ Browne, W. G.: *Travels in Africa, Egypt and Syria*. 4°. 2d ed.; London, 1806.

² Quatremère, E.: *Mémoires géographiques et historiques sur l'Egypt, etc.*, 2 Vols., 8°, Paris, 1811.

³ Hoskins, G. A.: *Visit to the Great Oasis of the Libyan Desert*. 8°, London, 1837.

named, as well as Beadnell, quotes the Egyptian census statistics as to its population respectively in 1897 and 1907.

Brugsch, Sayce, and Beadnell also give historical data concerning the Oasis. The original inhabitants are regarded as of Libyan (Berber) origin. Beadnell's work,¹ as also that of Ball, contains much interesting data concerning the Kharga wells and underground water tunnels, but no special observations are recorded on the inhabitants of the Oasis. The few references accorded them in this and other publications represent them as rather a backward, mild, and somewhat impotent people.

The physical anthropology of the Kharga people, especially, is as yet a virgin ground. But there is also a dearth of scientific information on the living Egyptians of the valley, though valuable series of observations on the latter have been published by Chantre and more recently by Myers of Cambridge.

4. GENERAL OBSERVATIONS, AND INFORMATION GATHERED BY THE WRITER

ENVIRONMENT

The shallow depression of the Kharga Oasis is an uneven, barren, predominantly sandy waste, partly surrounded or cut into by equally barren rocky scarps or hills. It is covered over a great area with moving sand-dunes, and spotted with smaller or larger patches of green within the waste: the watered ground and native settlements. Some of these patches are near enough each other to be within sight, but others are separated by large areas of the desert, forming really separate oases.

The largest of these inhabited and cultivated portions is that of the principal village or town, named also Kharga, and it was in this village and the neighborhood that the writer made his observations.

The life in the Oasis depends entirely on the water obtained from artesian wells, which are of native and to a large extent of ancient make, and which tap deep supplies in the Nubian sandstone that forms the floor of the whole depression. The water thus obtained makes possible the existence of a few moderate groves of date palm and of some gardens with olive as well as orange trees, and it serves for the irrigation of a limited extent of ground used for agricul-

¹ Beadnell, H. J. L.: *An Egyptian Oasis*, 8°, London, 1909, pp. 66-67.

ture.¹ On the irrigated fields the natives raise a variety of barley, rice, and some wheat, with a little sorghum and a few vegetables. The land is generally poor and, as at Ball's visit, over a decade ago, what is raised, excepting the dates, barely suffices for the home consumption. A quantity of the dates is exported to the Valley.

The climate is that of the Libyan desert in general, subtropical, except that the air, due to local evaporation, is less dry. Rain is very rare. The predominating winds are from the north, although during a part of the summer season sultry winds blow from the south. Sand storms are frequent at certain times of the year and are very troublesome.

The wells in the condition in which they are kept are by no means an unmitigated blessing. They are all open and many form pools, overflows, and marshy spots, which are instrumental in the generation of great numbers of mosquitoes of several varieties, including that which disseminates malaria.

The Oasis is also infested, especially in the spring and the summer months, with great numbers of small and ordinary-sized flies, which possess the annoying and dangerous instinct of trying to feed on the moisture or discharges of the eyes, nose, and mouth. They are the transmitters of trachoma and doubtless of other pathological conditions. Curiously they are decidedly more numerous and troublesome outside than inside the villages. In April of each year there appears at the watered places, in addition to the common varieties, a larger fly, which bites camels, inoculating them with a disease that often has a fatal result. Occasionally this fly also bites men, but in this case the bite is not dangerous. The Oasis harbors also several poisonous reptiles.²

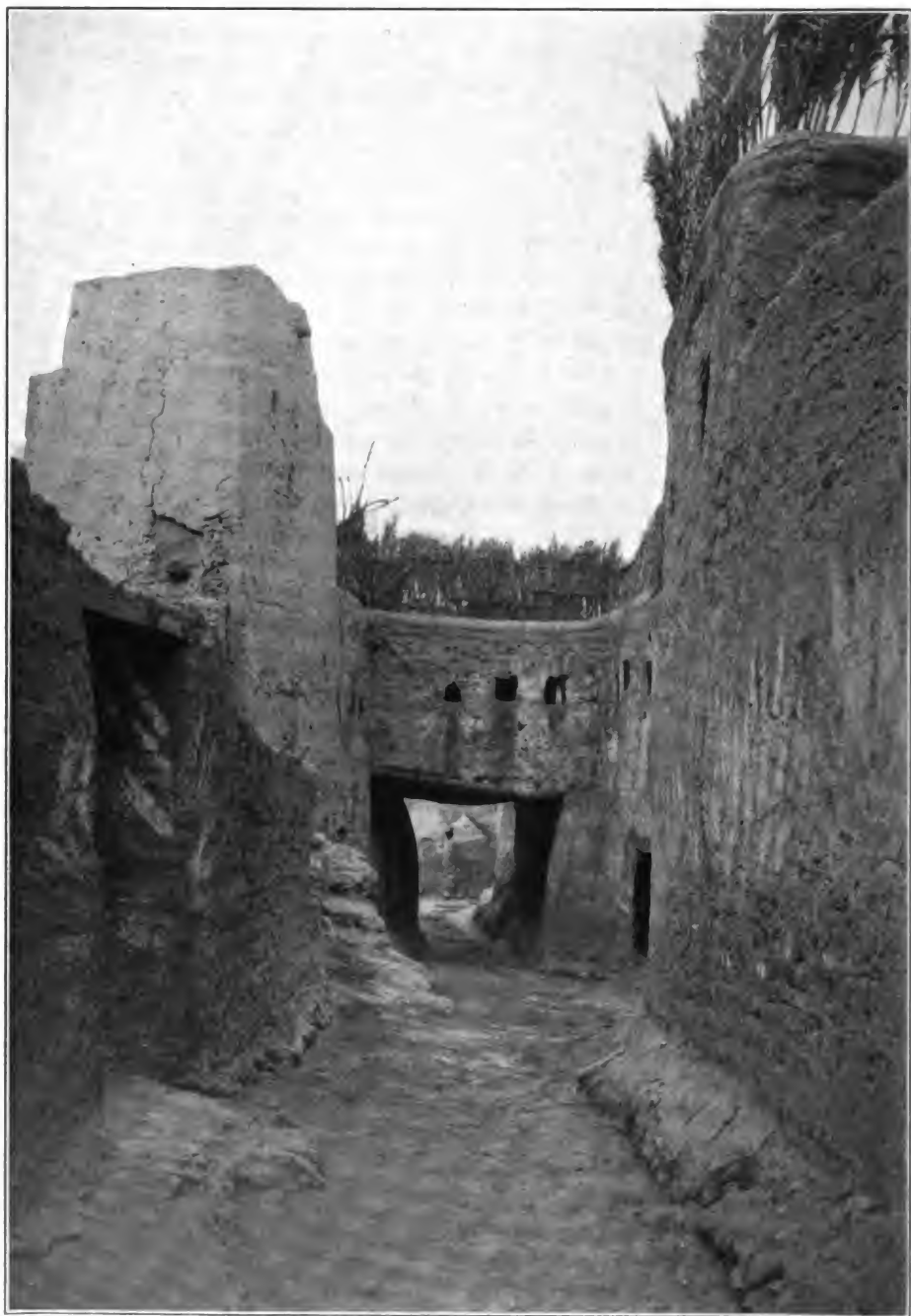
The Oasis natives live, as mentioned above, principally in four villages (Kharga, Gennah, Boulac, and Beris), though there are six other smaller settlements. These villages are of considerable interest from the standpoint of primitive architecture. By far the largest and most populous is Kharga, which is inhabited by about one-half of the total population of the Oasis, and deserves a brief special description (plates 1-3).

¹ The number of taxable palm trees in 1897, according to Ball (l. c. p. 46), was rather less than eight to each head of population, while the total taxed water supply per person amounted to about 15 cubic meters per day. These conditions have changed but little, if any, since then. The cultivated area of land was, in 1907, less than 19 square kilometers, or a little over half an acre to a person, out of the total oasis area of considerably over 3,000 square kilometers.

² Further details are given under notes on pathology.



**KHARGA OASIS: A TYPICAL STREET IN KHARGA VILLAGE WITH WOMEN'S AND CHILDREN'S
QUARTERS ON ROOFS**



KHARGA OASIS: A STREET IN KHARGA VILLAGE

Kharga may be called a great Egyptian village, modified in a peculiar manner by local requirements. It is constructed with special regard to protection from the sun, heat, and winds, and also for easier defense against invaders, an important precaution in the past. It is built of mud and sun-dried bricks; the posts of the dwellings are of palmwood, the ceilings of palm leaf ribs and mud.

The main part of the village is a maze of narrow, sinuous, intricate streets. Furthermore, in the case of most of the narrower passages the upper stories of the houses have been built completely across to the opposite side, converting the street into a tortuous, very dark, tunnel or gallery, five to seven feet high, which is always cool, quiet and free from blowing sand, and in which defense would be easy. A visitor can not find his way through these passages without a guide.

The houses are one to two stories high, in style like those of the poorer classes in the Valley. They are mostly small, irregular and piled together, as everywhere in Egypt. In many instances there is an open air living room on the top of the dwelling, fenced in by a hedge of dry palm leaves or ribs; this room is made use of mainly by the women and children (plate 2).

The dwellings as well as the streets are now kept, due to government regulations, in a neat condition, but formerly are said to have been filthy. There is, of course, no system of sewers and the disposal of sewage is primitive. Water is carried to the dwellings principally from a small open reservoir located within the town and fed by a surging well. It is distributed in goat-skins, and curiously, by blind men who, notwithstanding their defect, are said to be masters of all the intricacies of the streets and tunnel-like passages.

The apartments, so far as seen, are of very moderate dimensions and often lacking in light. There are also only poor provisions for the escape of smoke; but the inside rooms are quite fireproof and afford good protection against heat as well as cold, and against the winds and sands.

The people are in general poor. In occupation, the large majority are agriculturists, and they gain only enough for the bare necessities. They dress cheaply and lightly, in the main much like the fellaheen (agricultural workers) of the Nile Valley. The ordinary external robe or garment does not differ much in the two sexes; vests and inner garments, however (where worn), and also the outer garments of better quality, as well as decorations, are distinctive. Some of the women wear a metal ring which pierces one

of the alæ of the nose and hangs down to the lips. The head in men, closely cropped or even partly shaved, is covered with a closely fitting cap, or is lightly turbaned, that of the women at home bare, in public covered with an outer garment. The neck as a rule is uncovered. A large majority of individuals of both sexes go barefooted, except on special occasions.

The family life appears to be the same as that of the poor Egyptian of the Valley. Except the few who are better to do, the people sleep on the floor, on thin palm-strip mats, and, according to the village authorities, often without covers; not because they do not need the latter (though the rooms are probably never very cold), but because they have none.

The meals are generally only two a day, morning and evening; and among the majority of the population there is but little variety in the food. The predominant and often exclusive articles of diet are rice, in rice time; barley, in barley time; and dates, in date time. There is scarcely any milk and no butter. There are small tough chickens and their small eggs, but these go in a large part to the better conditioned and now in a measure also to the Valley. Meat among the ordinary people is not eaten more than perhaps, on the average, once a month, and then it is usually not of the best quality. They eat cats and probably dogs, though the latter are scarce, there being now only about a score in the whole village. The Kharga natives used to eat household animals of all kinds. They even ate camels that were diseased, butchering them just before they died, but this practice is now prohibited by the government.

Domestic animals consist of donkeys, a few cows, goats, and sheep. Donkeys are the most common. All these animals are diminutive in size and often poorly nourished. The few families who are better off financially own one or more camels, which alone of the domesticated Oasis animals are usually in a fairly good condition.

The occupation of the natives, as already mentioned, is almost exclusively agricultural work.¹ Industry and manufactures are lim-

¹ In census of 1907, the occupations of the Kharga people are given as follows:

	Male	Female
Agriculture	2,170	....
Cotton industry	5	....
Straw industry	42	3
Silk industry	2	8
Basket making .....	....	96
Miscellaneous	48	11
Transport and trade	55	....
Police and other parts of Civil Service.....	66	....
Religious	69	....
Midwives .....	....	8
Housework or no occupation.....	1,899	3,901

ited, the latter consisting of the production of mats, baskets, a variety of cloth, and some pottery. Of trade there is but little, and buying and selling has been and is still mostly by barter. Yet there are now several stores in which simple necessities can be purchased for money, and regular trade with the Valley is increasing.

The Kharga Oasis natives are not great workers, which, as will be seen further on, has its physiological and medical reasons.

SOCIAL AND MEDICAL RECORDS

As to social and medical matters, a few details were learned from the Omdeh (local head official), the Maowen (government head official) and the government physician. According to this information, there is in the Oasis scarcely any serious crime. The people do not like to fight and do not kill. They do not beat women or children. When anything is stolen, which is infrequent, a flag is put up as a sign that the property has been placed in the protection of a "sheikh," a dead holy man, in or near the place where the object was stolen, and this will often lead the thief to return the property.

As to family life, girls are married from nine years onward. They commence to menstruate mostly at from eleven to thirteen, and generally bear children soon after.

Marriage is not greatly binding. Among the poor they often marry when there are plenty of dates or other food; when the food supply has run low or been exhausted and the man can no longer support his wife, they separate. Next year, the parties may re-unite or marry others. Plurality of wives is said to be rare, they can not be provided for.

The number of children born is large (see Statistics), but there is also a high infant mortality. From the medical standpoint, the people, while not robust, can not be said to be very sickly. Only little, however, could be learned in this respect about the women, who are forbidden to associate with or even show their face to strangers.¹ The government doctor is not called to confinements.² He is not called to treat women at all. They are left when ill to nature, and their own devices.

There are no native "doctors" and there is but little folk-medicine. Written passages from the Koran often take the place of medicines. Curiously enough, there are traces or remnants of some medical

¹ The only opportunity the writer had of seeing the women with faces uncovered and in a larger number was during funerals which they are in the habit of attending, in fact, conducting.

² There are several native midwives.

usages of European origin, which must have been brought to the country by the Arabs. One of these is a vaccination which the natives, particularly the Bedouins, perform one on the other. It is a direct vaccination, some of the pus from the sores of a subject attacked with smallpox being introduced into an abrasion produced by a razor in the skin of the one to be protected. The wound is made preferably on the leg.

The most interesting condition is the apparent absence among these poor and mostly under-nourished people of tuberculosis, which recalls a similar condition among the poor Jews. No case of any variety, including scrofula, was seen at the Oasis by the writer, and none was seen by the government physician during his twelve months' stay at the village of Kharga or in other places in the Oasis. The physician declared, however, that he found tuberculosis of the lungs in several cases in camels.

Neither the doctor nor the civil authorities of the Kharga village could recall a single case of well marked rachitis, and no instance of the condition was encountered.

There have been no epidemics recently in the Oasis, with the exception of measles, in 1908.

Children die principally from gastro-enteritis, broncho-pneumonia, and of measles. The epidemic of the latter disease in 1908 carried off many infants.

There were seen no evidences of syphilis or gonorrhœa, but the diseases are said to exist as they do in the Valley.

Malaria is not very frequent, except in the date season (September-October), when there are also extraordinary numbers of flies and mosquitoes. It is occasionally of a very dangerous form. Typhoid is rare.

A most prevalent disorder is trachoma. There are great numbers of blind,¹ and in many more the eyes are more or less affected by various forms of inflammation.

A frequent condition, due probably in most if not all cases to trachoma is trichiasis (contraction due to inflammatory changes of the ventral surface of the lids, and consequent direction of the eye-lashes inward, so that they irritate the cornea). This condition is usually observed in the upper lid.

¹ According to the returns of the 1907 Egyptian census there were at the Kharga Oasis 196 blind in both eyes and 432 blind in one eye, or nearly 75 per thousand of the total population blind in one or both eyes. In the United States the percentage of those partly and completely blind is less than one per thousand of the population (in 1900, U. S. Census, 0.85 per thousand).

Insanity, the authorities of the village declared, is very rare ; within the last decade they knew in the village of Kharga of but one case, and that in a negro.¹ Imbecility and also epilepsy of lower grades, exist, but no definite data could be obtained as to their frequency. No one knew of any instance of advanced idiocy.

The presence of albinism is not certain. Two cases were reported of brown children with blue eyes, but they were not seen. Leukoderma or patch-albinism was found in a man of about 55 with semitic features. Very premature greyness, of probably different etiology from the preceding, was seen in one man about 30 years of age ; it was limited to the scalp.

Leprosy occurs, but the cases are isolated and rare.²

Fractures of bones and dislocations are very infrequent.

Scorpion bites occur each year. They are said to be occasionally fatal in children and sometimes also in adults, when the sting penetrates a blood vessel. There are two varieties of scorpion—a small yellow one which is found about the houses and a larger greenish one in the desert and hills.

There are in the Oasis at least two and possibly three varieties of poisonous snakes, including the ordinary sand viper, the horned viper, and possibly also a cobra. The last named, if it exists at all, is very rare. Several viper bites happen every year. Within the last twelve months the physician in the Kharga village treated three such, all in adult men. One of the bites was in the hand and the patient died in three days ; the other two men recovered. The treatment in the fatal case consisted of incision, injection of permanganate of potash and bandaging. In the other two (one being in a hand and one in a foot) it consisted of incisions with bandages and the administration of antitoxin. The fatal case showed great swelling of the limb without any petechiæ, then failing vitality with weakening pulse and respiration. The poison acted, apparently, as a nervous depressant.

The before-mentioned camel fly, which comes in April and causes the death of camels unless these are driven away into the desert, will also occasionally bite man. The wound is painful, but no further consequences have been observed.

Nothing definite was learned concerning parasitism, particularly internal, nor about numerous other conditions which require extended and detailed medical observation.

¹There were, in 1907, according to the census returns, two insane in the Oasis.

²In 1907 four cases of leprosy were reported to the census from the whole Kharga Oasis.

5. VITAL STATISTICS OF THE KHARGA OASIS

POPULATION IN 1907

The following data are based mainly on records furnished to the writer by the Kharga authorities,¹ and on the last two Egyptian censuses.

In 1897 the total population of the Oasis, according to the Egyptian Census of that year,² was 7,220. At the beginning of 1907, it was 8,424, and at the beginning of 1909, near 8,495.³ The increase for the decade to 1907 amounted to 16.7 per cent, but during the last four years of the period it was in all probability, due to the absence of epidemics and hence lesser mortality, more rapid, being equal to 22 per cent per decade. This last is a rate of natural increase not equalled in any of the larger territorial groups of whites; but even the rate of 16.7 (or 16.1 per cent), is a very high one, being reached among the whites only in some localized areas in Germany and one or two other countries. But this rate is almost exactly like that of Egypt as a whole, the net increase of population in that country from 1897 to 1907 being 16 per cent..

This relatively rapid augmentation in numbers of the Oasis people is due, as will be seen from later tables, on one hand to a large birth-rate and on the other to an unexpectedly moderate death-rate, in years free from epidemics.

The distribution of the population according to the four districts of the Kharga Oasis, and the population per dwelling, was in 1907 as follows:

POPULATION OF THE KHARGA OASIS, AT THE BEGINNING OF 1907, ACCORDING TO THE DISTRICTS

District	Total number of houses	Total number of inhabitants
Kharga	1,285	5,322
Gennah	97	520
Boulac	195	1,016
Beris	452	1,566
Total	2,029 dwellings.	8,424 inhabitants.

(A little over 4.1 to a dwelling.)

¹ The writer is especially indebted in this connection to M. Mohammed Cherif, the Maowen of the Oasis. The data were said to be entirely accurate.

² Recensement général de l'Egypte, Vol. 2, Le Caire, 1898, pp. 215, 274, etc. Ball (l. c., p. 46) and after him Beadnell ("An Egyptian Oasis," etc., p. 61), give 7,856. The difference between the number given by the census and that of Ball is not explainable, but the census number, judging by the increase of the population from 1904 to 1908, is the more correct.

³ The 1907 census of Egypt (4°, Cairo, 1909), gives 41 less or 8,383, which would correspond to an increase for the decade of 16.1 per cent. As the figure given to the writer is substantiated by the detailed data on births and deaths, it will be used in preference. The difference, after all, is small.

The above shows principally that overcrowding of dwellings is not, in general, prevalent at the Oasis.

As to the proportion of sexes in the Kharga population, the actual conditions could not be determined. The Egyptian census of 1897, however, gave 3,671 males and 3,549 females, or 967 of the latter to each 1,000 of the former, and exactly the same proportion was found at that date in the whole of Egypt. The 1907 Egyptian census unfortunately seems to be less accurate. It gives for the Kharga Oasis 4,356 male and only 4,027 female individuals, which yields the ratio of but 925 females to 1,000 males, while for whole Egypt the same ratio was at the same date 992 to 1,000. The figures applying to the Oasis are evidently erroneous. They would indicate the existence of 108.2 males to each 100 females, which great disproportion is in no way sustained. It disagrees greatly with the data of the previous census. It is unequalled in Egypt or elsewhere, except in regions that have received immigrations of males, or at least an excess of males, which has not occurred in the Oasis. And it is opposed by the detailed birth and death records given in the following pages. It has been already shown that the 1907 census figures as a whole differ from those furnished by the Oasis authorities, and they are evidently also unreliable in regard to the numbers of males and females in the population.

BIRTHS AND DEATHS

The details concerning the vital statistics of the Kharga Oasis, received from the local authorities, are not very extensive, nor equally complete for all the districts, nevertheless they show several interesting conditions.

VITAL STATISTICS OF THE KHARGA VILLAGE FOR FIVE YEARS

Year	Population at the beginning of the year	Born		Total	Per 1,000 of population	Died		Total	Per 1,000 of population
		Males	Females			Males	Females		
1904	4,978	....	....	254	51.0	....	....	138	27.7
1905	5,094	121	113	234	45.9	62	57	119	23.4
1906	5,209	129	119	248	47.6	73	62	135	25.9
1907	5,322	135	147	282	53.0	61	72	133	25.5
1908	5,471	103	114	217	39.7	192	160	352	64.3 ¹
1909	5,336	....	....	....	....	....	....	....	....
Total..	....	488 ²	493 ²	1235 ³	....³	388 ²	351 ²	877 ³	....
Avg..	(5,215)	122	123	247	47.4	97	88	175 ³	33.7 ³
	1904-'7: 5151	....	....	....	....	....	....	131	25.4

¹ Epidemic of measles.

² For 4 years.

³ For 5 years.

VITAL STATISTICS OF THE GENNAH VILLAGE FOR FIVE YEARS

Year	Population at the beginning of the year	Born		Total	Per 1,000 of population	Died		Total	Per 1,000 of population
		Males	Females			Males	Females		
1904	498	..	..	22	44.2	..	..	8	16.1
1905	512	9	12	21	41.0	7	9	16	31.2
1906	517	4	8	12	23.2	5	10	15	29.0
1907	520	5	12	17	32.7	7	4	11	21.2
1908	526	12	10	22	41.8	3	5	8	15.2
1909	540	..	..	..	....	..	..	..	....
Total.	...	30 ¹	42 ¹	94 ²	....	22 ¹	28 ¹	58 ²	....
Avg..	515 ³	7.5	10.5	19	36.9	5.5	7	11.6	22.5

¹ For 4 years.² For 5 years.VITAL STATISTICS OF THE VILLAGES BOULAC AND BERIS
FOR ONE YEAR, APRIL 1, 1907, TO APRIL 1, 1908

		For 18 months, to October 1, 1908 ¹	
Joint population at the beginning of 1907....		2,582	
Joint population at the beginning of 1908....		2,638	
Born:			
Males	44	73	
Females	45	66	
Total	89	139	
Rate, per 1000 of population, near	34.5	35.5	
Died:			
Males	17	51	
Females	22	63	
Total	39	114	
Rate, per 1000 of population, near	15.1	29.5	

The birth-rate at the Kharga Oasis, it is seen, is very high. It is higher than anywhere in Europe, except in some parts of Russia and in the Hungary group of nationalities.² It harmonizes, however, with that of Egypt in general, where it averaged, among the native

¹ With an epidemic of measles in May at Beris.

² In Europe the birth-rate ranges, according to the most recent statistics, from approximately 22 per 1000 in France to a little over 40 in some of the groups of peoples under Hungary and to well over 40 in many parts of Russia. The death-rate ranges from a little less than 17 in Sweden to 29.9 per thousand (reports of 1904) in Russia, and the natural yearly increase per 1000 population from 0.7 in France to 14.0 in Germany. In the United States the birth-rate, while not exactly known, is probably less than 30 per 1000; the death-rate (in the registration area) approximately 18; and the yearly increment a little over 12 per 1000.

Egyptians of the principal towns and for the seven years from 1901 to 1907, 43.4 per 1000 population.¹

The large birth-rate at the Oasis indicates, outside of its significant relation to that of the Valley, two interesting conditions. It shows that the people are very prolific, notwithstanding the seemingly unfavorable factors of poor nourishment, the Oasis climate, the prevalent seclusion of the women, the very early marriages, with considerable intermarriage. It also shows that the people are well acclimatized to the locality, and suggests that the latter is probably not as unhealthful as unattractive.

The death-rate of the Oasis is also high when compared with that of the more civilized countries of white man. But it is not much higher than in those regions of Europe where the birth-rate is equally or nearly as high as it is at the Oasis, and is almost identical with that of Egypt as a whole.

The similarity of birth-rate and death-rate, and hence of natural increase in population, between the Oasis people and the rest of the Egyptians, is a fact of considerable importance. It indicates strongly a fundamental similarity of environmental and social conditions, and also a probable close similarity, at the present time at least, of the ethnic elements in the two regions.

The birth and death statistics afford also a closer insight into the proportion of sexes at the Oasis. During the 1905-08 period, covered by the detailed data, the proportion of males to females at birth and death has been as follows:

SEX RATE AT THE KHARGA OASIS

Year	Villages	Sex rate at birth (Females = 100)	Sex rate at death (Females = 100)
1905	Kharga and Gennah districts...	104	104.5
1906	Kharga and Gennah districts...	104.7	109.9
1907	All districts, near.....	98	101.8
1908	All districts, near.....	98	101.8

Evidently the relation of males to females, both born and died, differs to quite an extent from year to year, and also the same year

Year	Birth-rate per 1,000 in the principal towns of Egypt	Death-rate per 100 in the principal towns of Egypt	Natural increase per 1,000 population
1901	42.3	33.3	9.0
1902	42.7	36.7	6.0
1903	42.5	32.0	10.5
1904	44.1	38.2	5.9
1905	43.8	34.2	9.6
1906	44.7	33.9	10.8
1907	43.7	36.7	7.0
Average	43.4	35.0	8.4

"Births and Deaths in the Principal Towns of Egypt During the Years 1901-1906 (and 1907)," Fol. Cairo, 1907-'08.

in the different villages—as it does occasionally among smaller groups of other peoples. But the whole of the data shows conditions in favor of the relative numbers of the females, which must be regarded, from what is known on the subject, as a favorable breeding condition. The average proportion of males to females at birth among the whites ranges between 105 and 106 to 100,¹ or, in round numbers, there are 94 to 95 females to each 100 males. In the American negro, however, the proportion rises to 99.1 females to every 100 males, which is the highest proportion thus far recorded for any people.² In the principal towns of Egypt, in 1909, the proportion of sexes at birth among the native population was 103.3 males to each 100 females, or 96.8 females to each 100 males, which is probably very near to the average condition for the last decade at Kharga.

The next tables give the movement in population in the Kharga village month by month, and that in Kharga and Gennah by the quarter of the year. It will be observed that births predominate somewhat in April-June, corresponding to conception in August-October, which latter is a season of the date harvest and relative plenty at the Oasis, and that the least proportion occurs in the January-March quarter; yet the differences are not great, especially if the probable errors of the data be discounted.

More definite seasonal differences, however, are observed in the mortality, which is greatest in the last and then in the first quarters of the year, and least from July to September. The sudden rise from the late summer and early fall minimum to the subsequent winter maximum was not known of during the writer's stay at the Oasis and hence the causes of the fact were not inquired into; but they are doubtless in the main of environmental origin.

**VITAL STATISTICS OF THE KHARGA AND GENNAH VILLAGES
FROM 1905 TO 1908, INCLUSIVE, BY QUARTERS**

	Births Average per month	Deaths Average per month
January-March	19.9	11.1
April-June ³	23.8	10.4
July-September	21.1	9.9
October-December	22.8	14.0

¹ Nichols, J. B.: The Numerical Proportion of the Sexes at Birth. Mem. Anthropol. Assoc. Vol. 1, part 4, Lancaster, Pa., 1907, pp. 249-300.

² It would be interesting to ascertain whether or not this is a racial trait, or one applicable also to the Soudanese and Nubians, in which case the admixture of the latter into the Egyptian and the Kharga Oasis people might possibly account for the relatively high female birth-rate among these.

³ The three months epidemic of 1908 at Kharga, which will be noticed in the next table, excluded.

**BIRTHS AND DEATHS AT THE KHARGA VILLAGE FOR FOUR
YEARS BY MONTHS**

Month	1905			1906			1907			1908		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
January	9	11	20	9	5	14	15	13	28	9	12	21
February	9	15	24	8	8	16	14	8	22	6	4	10
March	13	5	18	8	11	19	4	8	12	11	6	17
April	8	15	23	8	12	20	11	13	24	8	11	19
May	12	12	24	13	12	25	19	11	30	16	9	25
June	11	14	25	13	6	19	5	9	14	10	12	22
July	7	6	13	8	10	18	14	14	28	6	15	21
August	5	7	12	12	8	20	9	14	23	7	9	16
September	14	4	18	8	10	18	12	18	30	8	9	17
October	11	6	17	16	16	32	10	18	28	7	8	15
November	12	10	22	14	12	26	14	14	28	8	10	18
December	10	8	18	12	9	21	8	7	15	7	9	16
Total	121	113	234	129	119	248	135	147	282	103	114	217

Month	1905			1906			1907			1908		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
January	9	5	14	10	2	12	6	7	13	3	2	5
February	3	4	7	3	6	9	6	7	13	5	6	11
March	3	4	7	7	6	13	2	8	10	6	1	7
April	7	2	9	7	6	13	3	6	9	46	48	94
May	5	7	12	6	7	13	3	6	9	90	56	146
June	4	6	10	3	4	7	3	2	5	17	16	33
July	3	6	9	6	1	7	5	6	11	5	9	14
August	3	3	6	4	6	10	4	4	8	2	4	6
September	4	6	10	7	4	11	3	5	8	5	5	10
October	5	4	9	9	6	15	4	6	10	6	2	8
November	8	6	14	4	8	12	14	5	19	4	6	10
December	8	4	12	7	6	13	8	10	18	3	5	8
Total	62	57	119	73	62	135	61	72	133	192	160	352

RÉSUMÉ OF VITAL STATISTICS OF THE KHARGA OASIS

To summarize, the vital statistics data of the Kharga Oasis have shown: (1) A steady high birth-rate; (2) barring years with epidemics, a moderately high death-rate; (3) a relatively rapid rate of natural increase in population; (4) a slight seasonal difference in proportion of births, and a more marked one in proportion of deaths; (5) a relatively high proportion, both at birth and in population, of females; and (6) a very close similarity in all these items to the conditions in Egypt in general.

6. PHYSIOLOGICAL OBSERVATIONS ON THE KHARGA OASIS NATIVES

The people of the Oasis, while ignorant, and therefore apprehensive and superstitious, were found on the whole to be fairly intelligent. They are mild, polite, not very energetic or enterprising, but not idlers. They are in general poorly nourished and show the effects of that condition in their lack of initiative and diminished strength as well as endurance, which conditions are marked in all their activities.

The observations to be recorded were made during the latter part of February, which is a season quite free from climatic extremes and a healthier one than other parts of the year.

The tests undertaken were the same as those on Indians, reported by the writer in 1908,¹ and were carried out with the same instruments and in like manner, so that these two series of data are entirely comparable. They relate to the pulse, respiration, temperature, and manual with arm strength of the people, and extend to 150 adult males. The subjects were mainly from the Kharga village and nearby settlements. They were all free, it should be stated again, from negro admixture, as far as ascertainable, and free from any complaints or disease which would incapacitate them for work. They were examined as a rule only after being rested and in the absence of exciting circumstances. The men took to the examination kindly; if any were found in whom the state of the tongue or other organs indicated a systemic disarrangement of any consequence, they were excluded; and with the other precautions taken, it seems safe to say that the results which will be given in the following pages, represent fairly the normal or average conditions at the Oasis, at that period. The examination of the women and children would have added materially to the interest and value of these tests, but for reasons already stated was impossible.

PULSE²

The results on 94 healthy male individuals, of all ages, as shown in the accompanying table, give an average which is by 4 or 5 beats

¹ Hrdlička, A.: *Physiological and Medical Observations Among the Indians of Southwestern United States and Northern Mexico*. Bull. 34, Bureau Amer. Ethnology, 8°, Washington, 1908, pp. 1-460.

² Compare data in writer's "Physiological and Medical Observations, etc., pp. 138 et seq.

per minute higher than the general average in male whites, and from 9 to 19 beats per minute higher than shown by various tribes of the American native. The most common pulse-rates at Kharga are those between 71 and 80.

KHARGA OASIS, MEN: PULSE (PER MINUTE) ¹

Number of observations: 94.

Average: 76. (1st series of 46: 77.5; 2d series of 48: 74.5.)

Median: 75. Mode: 72.

Minimum: 54. Maximum: 105.

Table of frequencies:

	54-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105
Number of cases....	1	8	8	20	21	14	2	8	1	1	1
Per cent	1.1	8.5	8.5	30.8	22.3	14.9	2.1	8.5	1.1	1.1	1.1

¹ In sitting position.

The causes of the frequency of a relatively rapid pulse and hence heart-beat at the Oasis are not easy to determine. The phenomenon is not due to rarefied air, for the Oasis lies, on the average, less than 100 meters above the sea-level. It is in no case connected with alcoholism, for that vice is practically absent,¹ nor with any abuse or even the use of coffee, tea or tobacco, which articles are still to a large extent luxuries in the Oasis. There are also no drug habits. The general environmental conditions, finally, are much like those in the American deserts, and in the latter no accelerating influence has been manifested thus far on the slow pulse of the Indian. It therefore seems that the relatively high pulse rate at the Oasis is in the main a long established, hereditary condition.

Further inquiries, however, were made into the subject, to show what, if any, relation the phenomenon had to the most important conditions of the body.

¹ The natives make a sort of beer from the sap of the date-palm and a stronger liquor from the dates, but the quantity made is not large and is limited, particularly in the latter case, in season. According to Beadnell (An Egyptian Oasis, p. 218), the weaker liquor is called "lagmi." It "has a peculiar insipid taste. It is obtained by making a deep incision in the top of the date-palm, the liquid oozing out and being collected in a vessel, generally made of the rind of a gourd. As much as 10 quarts can be obtained in a day, and the tree may be bled once or twice a month without sustaining any harm; the operation may, in fact, prove of considerable benefit to a sickly palm."

A reference to the table on page 27 will show that, so far as these data reach, no clear difference is appreciable between the pulse-rate of the youngest and oldest adults examined. The series, however, does not comprise many individuals above 55 years of age (estimated), and is in general too limited for definite conclusions. One point is evident, and that is the fact that age effects on the pulse-rate up to the fifty-fifth year, if they exist, are irregular at the Oasis.

A more marked relation was detected between the pulse-rate and the stature. Taking the healthy adults up to 50 years of age, the 15 men of the highest stature give an average pulse-rate 2.9 beats higher than the 20 of the lowest stature. The details given on the table on page 28 show especially the frequent occurrence of sub-average pulse-rate in those of short height. The association of a higher average pulse-rate with tall statures has been observed in whites¹ and also in Indians,² so that it is probably a more or less irregular but prevalent physiological condition. What is the real direct cause of the pulse acceleration in those of tall stature, is as yet somewhat problematical.

Still another condition inquired into was the relation of the pulse-rate to vigor, as indicated by the tests of strength. The 18 weakest but healthy men gave the average pulse-rate of 74.5, the 16 strongest 75.4. Both of these figures are curiously below the general average (= 76). The difference between the two series is small, but there are indications that it is not accidental (see table on page 28). The matter is, however, complicated by the fact that in many instances greater muscular strength corresponds with taller stature. Some further light will be thrown on these points by the results of tests of other functions.

The relation of pulse to respiration and body temperature will be referred to under these headings.

RESPIRATION

The respiration-rate averages in the healthy Kharga men, as seen from the figures below, 18.4 per minute, which is slightly above the general averages in both the whites and the Indian.³ The difference,

¹ Volkmann, A. W.: *Die Haemodynamik nach Versuchen*, 8°, 1850, p. 429 et seq.

² Hrdlička, A.: *Physiological and Medical Observations*, etc., p. 141 et seq.

³ Compare data in Vierordt, H., *Anatomische, Physiologische und Physikalische Daten und Tabellen*, 8. Jena. 1893, p. 166. Also Smith, E.: *Trans. Roy. Med. & Chir. Society, London*, Vol. 39, 1856.

amounting to about one respiration more every two minutes, is so small that, were it not for the simultaneous and better defined excess in pulse-rate, it could be disregarded. As it is, it is probably an expression of correlated action of the lungs and the heart.

KHARGA OASIS, MEN: RESPIRATION (PER MINUTE)¹

Number of observations: 94.

Average: 18.4. (1st series of 46: 18.6; 2d series of 48: 18.3.)

Median: 18. Mode: 18.

Minimum: 14. Maximum: 24.

Table of frequencies:

	14-15	16-17	18-19	20-21	22-23	24
Number of cases.....	12	18	33	18	9	4
Per cent	12.8	19.2	35.1	19.2	9.6	4.3

¹ Sitting, at rest.

The numerical relation of the pulse-beats to respiration averages 4.13, which is practically the same as in whites.

In regard to age, the youngest adults of the series examined show (see table on page 27) a slightly greater average (+ 0.4 per minute) than the oldest ones. A similar condition was observed by the writer in the Indians and it also exists in the whites. As a result of this and of the frequently observed more rapid pulse in old age, the pulse-beat: respiration ratio is slightly higher in senility than earlier in adult life.

As to stature, the shortest healthy men up to 50 years of age gave a lower average by nearly one breath a minute than the taller ones (for details see table on page 28). This stands again in correlation with the lower average pulse in those of short stature, but it is not possible to say whether the condition is characteristic of the people of the Oasis, or is merely an accidental feature of this group. How far it may be true of other ethnic groups is as yet uncertain.

The pulse-respiration ratio in the two groups remains almost identical (4.18 for the short, 4.16 for the tall), showing that there has been a harmonious response in this line of the two functions.

A similar condition to that in the shortest adult prevails also in those who are weakest muscularly—the series give a perceptibly lower average rate of respiration (as they did of pulse-rate) than that of the strongest individuals (see details in table on page 28). The difference of the averages amounts to 0.7 of a respiration per minute in favor of the strongest. The rate in the latter is also

higher than the general average. The pulse-respiration ratio, however, is relatively small in the "strongest," amounting to only 3.97 (in the weakest = 4.07). This condition of subaverage pulse-rate with above-average respiration-rate in the Kharga "strongest" group is not understood. As a great many individual elements enter into every expression of these series and as the latter are not large enough to submerge the effects of all such conditions, the discrepancy may be accidental. It is regrettable that no detailed extensive data of similar nature exist as yet on the whites, the subject being far from exhausted in that race alone.

TEMPERATURE

The temperature of the body was taken in every case with verified thermometers, under the tongue, with the subject sitting, and with the instrument in place for at least five minutes. All the tests were made between 9 A. M. and 5 P. M. and were about equally distributed over the intervening hours. The results are as follows:

KHARGA OASIS, MEN: TEMPERATURE

Number of observations: 95.

Average: 98.6° F. (1st series of 47: 98.7°; 2d series of 48: 98.5°.)

Median: 98.7°. Mode: 2 groups, 98.5°, 98.9°.

Minimum: 96.2°. Maximum: 99.9°.

Table of frequencies:

	96.2°	96.5°-96.9°	97°-97.4°	97.5°-97.9°	98°-98.4°	98.5°-98.9°	99°-99.4°	99.5°-99.9°
Number of cases.....	1	2	4	12	14	29	25	8
Per cent	1.1	2.1	4.2	12.6	14.7	30.5	26.3	8.4

The average temperature in the European amounts to about 98.9° F. (37.2° C.); the male Indians have given the writer averages, according to tribes, varying from 98.1 to 98.8; the Kharga males show 98.6°.

In the whites each 10° F. temperature correspond, on the average, to 7.28 pulse-beats and 1.82 respirations; in the Indians, to 6.40 pulse-beats and 1.78 respirations; and in the Kharga natives to 7.71 pulse-beats and 1.87 respirations. These are differences well beyond the limits of the probable error, and hence are of significance, though their exact explanation can hardly as yet be attempted. The temperature of the Oasis men is, plainly, low in relation to both pulse and

respiration as compared with the whites, and especially with the Indians. It is also absolutely somewhat lower than in the whites. This condition means probably, in the main, a somewhat lower intensity in the Kharga natives of general metabolism, which agrees well with the poorer nutrition of a large proportion of the Oasis population; but it is doubtless also influenced by a greater heat radiation from the skin, due to the subtropical climate of the Oasis.

As to age, the oldest Kharga adults show, as seen in the next table, a slightly lower average temperature than the youngest ones. The difference would be quite insignificant, however, except for the fact that it agrees with what is known in this respect of whites and what

KHARGA OASIS: PULSE, RESPIRATION, AND TEMPERATURE IN RELATION TO AGE

Fifteen youngest men: 21-26 years				Fourteen oldest men: 55-65 years			
Age	Pulse (sitting) per minute	Respiration (sitting) per minute	Temperature (sub-lingua), grades	Age	Pulse (sitting) per minute	Respiration (sitting) per minute	Temperature (sub-lingua), grades
<i>Years</i>			<i>° F</i>	<i>Years</i>			<i>° F</i>
21	72	18	98.0	55 ¹	(100)	(17)	(98.8)
22	81	20	98.7	55	92	16	98.6
23	72	20	97.4	55 ²	62	20	97.9
24 ¹	75	15	99.1	55 ³	78	19	98.3
24 ²	(72)	(16)	(96.2)	55	72	17	98.2
24 ³	(84)	(19)	(99.2)	55 ⁴	90	22	99.2
24	78	20	99.4	55	69	16	97.6
24 ⁴	96	19	99.3	55	60	15	97.7
25 ⁵	81	22	97.7	55 ⁵	84	19	99.3
25	74	18	98.4	58 ⁶	72	18	98.4
25	78	19	99.1	60	72	20	98.7
26	73	21	99.2	60 ⁷	(72)	(22)	(99.6)
26 ⁶	66	18	98.5	60 ⁸	72	14	98.6
26	84	18	98.9	65 ⁹	90	20	99.4
26	72	18	98.8				

Averages (exclusive of the cases in parentheses):

24.3	75.5	18.9	98.7	57	76.1	18.5	98.5
------	------	------	------	----	------	------	------

¹ 3 P. M.; tongue slightly whitish.

² 10 A. M.; low temperature possibly due to hunger.

³ Sore throat.

⁴ 11.55 A. M.; tongue somewhat coated.

⁵ 10.40 A. M.; tongue slightly coated.

⁶ 12.50 P. M.; tongue slightly coated.

¹ Sore throat.

² 2.15 P. M.; tongue slightly coated.

³ 9.40 A. M.; tongue yellowish.

⁴ 4.10 P. M.; tongue yellowish coated.

⁵ 1.50 P. M.; tongue slightly coated.

⁶ 11.50 A. M.; tongue slightly coated.

⁷ 10.25 A. M.; tongue all coated.

⁸ 12.30 P. M.; cause of slow respiration?

⁹ 3.15 P. M.; tongue yellow-coated.

has been observed in the Indians. The smallness of the difference is due principally to the fact that no really senile or very old individuals are included in the Kharga series.

**KHARGA OASIS: PULSE, RESPIRATION, AND TEMPERATURE IN
RELATION TO EXTREMES OF STATURE¹**

20 shortest men, 152.3-159.8 cm. (average age 33.9 years)				15 tallest men, 167.1-173.8 cm. (average age 39.7 years)			
Stature	Pulse (sitting) per minute	Respiration (sitting) per minute	Temper- ature (sub-lingua) 5 minutes exposure	Stature	Pulse (sitting) per minute	Respiration (sitting) per minute	Temper- ature (sub-lingua) 5 minutes exposure
cm.			° F.	cm.			° F.
152.3	78	18	97.9	167.1	78	18	98.3
153.6	78	16	99.2	167.3	78	22	98.5
155.7	65	14	98.3	168.2	78	22	98.3
155.9	72	20	98.9	168.3	72	17	98.1
156.0	77	17	97.9	168.8	76	21	98.9
157.5	81	22	97.7	168.9	82	17	99.2
157.8	72	20	97.4	169.4	68	18	98.5
158.3	92	22	99.5	169.4	84	19	98.9
158.4	70	16	97.8	170.5	82	18	98.8
158.5	74	20	99.2	171.3	76	18	99.1
158.5	70	18	99.2	172.2	92	16	98.6
158.7	72	21	98.9	172.4	71	18	99.1
158.7	76	16	98.5	172.5	70	18	98.1
158.8	72	18	98.0	172.7	82	21	98.2
159.3	80	15	99.3	173.8	78	18	99.6
159.4	78	15	98.9				
159.5	69	18	98.7				
159.6	72	16	97.5				
159.7	78	20	99.4				
159.8	72	16	96.2				
Averages:							
157.8	74.9	17.9	98.4	170.2	77.8	18.7	98.7

¹ In adult healthy men of not more than 50 years of age.

**KHARGA OASIS: PULSE, RESPIRATION, AND TEMPERATURE IN
RELATION TO VIGOR**

18 weakest healthy men (up to 50 years of age)				16 strongest healthy men (up to 50 years of age)			
Average pressure force in right hand	Average pulse (sit- ting)	Average respiration (sitting)	Average temperature (sub-lingua)	Average pressure force in right hand	Average pulse (sit- ting)	Average respiration (sitting)	Average temperature (sub-lingua)
Kg.	Per min.	Per min.	° F.	Kg.	Per min.	Per min.	° F.
28	74.5	18.3	98.3	41	75.4	19.0	98.6

In relation to stature, the temperature is on the average higher in the "tallest" than it is in the "shortest" Kharga natives. And the temperature goes hand in hand in these groups with both pulse and respiration. The "shortest" males at the Oasis show thus on the average a somewhat less active metabolism, as well as a slower heart and slower respiration. They manifest lesser vitality, which suggests a causal relation between at least some of the low statures at the Oasis and the agencies which condition lowered vitality. The main of these conditions are probably chronic malnutrition, and protracted effects during the developmental stage of life of malaria or other systemic disorders. The tallest Kharga men are, on the average, of a distinctly superior vitality.

Muscular potency shows similar relation to temperature as age and stature: It is in general perceptibly below the average in those who give low temperature, and both go together with sub-average pulse rate as well as respiration-rate. The individuals of the best muscular vigor show mean temperature, with slightly sub-average pulse, but somewhat above average respiration. A larger series of observations would in these respects be very desirable.

MUSCULAR STRENGTH

The tests of muscular strength were those of pressure in each hand and traction.¹ They were made by Mathieu's dynamometer and represent the maximum exertion of the subjects determined in two to four consecutive trials. The hands and arms were in every case held free from the body and cases with crippled or sore fingers, hands or arms were excluded. There was no unwillingness or lack of interest on the part of those examined in making the tests, so that the record obtained may be regarded as fairly representative of the true condition in regard to muscular strength of the Kharga men.

The results are seen in the following tables.

¹ With the medius of each hand linked into the arch of the instrument at its small end and the arms held not higher than the chin.

KHARGA OASIS, MEN: PRESSURE FORCE IN THE HANDS¹

Number of observations in each hand: 115.

Average, right hand: 33.8; left hand: 31.1 kg. (1st 50: right hand 33.4, left hand 30.9; 2d 50: right hand 33.4, left hand 31.2.)

Median: right hand 33, left hand 31. Modes: right hand 28 and 34, left hand 31.

Minimum: right hand 24, left hand 21. Maximum: right hand 49, left hand 45.

Table of frequencies:

	20-21	22-23	24-25	26-27	28-29	30-31	32-33
Number of cases:							
right hand .....	....	....	2	14	16	14	13
left hand	2	2	13	17	12	22	7
Per cent:							
right hand .....	....	....	1.7	12.2	13.9	12.2	11.3
left hand	1.7	1.7	11.3	14.8	10.4	19.1	6.1

	34-35	36-37	38-39	40-41	42-43	44-45	46-47	48-49
Number of cases:								
right hand	19	10	4	9	5	6	2	1
left hand	15	9	11	1	4	....	....	....
Per cent:								
right hand	16.5	8.7	3.5	7.8	4.3	5.2	1.7	0.9
left hand	13.0	7.8	9.6	0.9	3.5	....	....	....

¹ Maximum, in kilograms.

KHARGA OASIS, MEN: TESTS OF MUSCULAR FORCE: TRACTION¹

Number of observations: 111.

Average: 22.3 kg. (1st 50: 21.3; 2d 50: 22.6.)

Median: 21. Mode: 25.

Minimum: 12. Maximum: 37.

Table of frequencies:

	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-35	36-37
Number of cases.	2	10	14	12	17	10	16	13	3	7	5	1	1
Per cent.....	1.8	9.0	12.6	10.8	15.3	9.0	14.4	11.7	2.7	6.3	4.5	0.9	0.0

¹ In kilograms.

The above data show that the Kharga natives are on the average a rather weak lot. The pressure force, with the same instrument and method, averages in white males in the right hand about 45 kg., in the left 37 kg., and the traction 27 kg. Fifteen healthy and as far as

could be determined full-blood American negro men gave the writer, with the same instrument, as the mean pressure in the right hand 41.5, in the left hand 38.6 kg., and traction of 30 kg. In the Indian,¹ in general, the corresponding figures are about 40, 34, and 25 kg. At Kharga they are, as seen above, 34, 31, and 22 kg.

The debility of the Kharga men is in all probability the effect, in the main, of poor and scant nutrition. The Valley fellaheen impress one as somewhat better off in this respect, and also as somewhat stronger, yet even they, so far as observed, do not approach in muscular strength the whites or the negro of similar vocations.

The average difference between the pressure force of the right and that of the left hand is less marked in the Kharga natives than that in the white and also the Indian, showing that the right hand is not only absolutely but also relatively weaker in those of the Oasis.

The age differences in strength are quite pronounced and follow what is probably a general rule, showing a gradual decline after 40 years of age. The maximum mean of muscular power is reached between 30 and 40, or more properly between 25 and 35 years, which appears also to be most frequently the case in the whites as well as in the American Indians.

KHARGA OASIS, MEN: RESULTS OF TESTS OF MUSCULAR STRENGTH OF THE HANDS (PRESSURE) AND ARMS (TRACTION), ACCORDING TO AGE :

Age groups	Maximum pressure right hand	Maximum pressure left hand	Maximum traction, horizontal
21-30 years			
Number of subjects.....	(42)	(42)	(39)
Average	33.9	31.6	22.3
Minimum	26	21	14
Maximum	49	45	35
31-40 years			
Number of subjects.....	(20)	(20)	(19)
Average	36.5	33.7	24.6
Minimum	29.5	26	16
Maximum	46	45	33
41-50 years			
Number of subjects.....	(35)	(35)	(35)
Average	33.2	31.0	21.6
Minimum	24	21	14
Maximum	46	44	30.5
51-60 years			
Number of subjects.....	(17)	(17)	(14)
Average	31.6	29.1	21.2
Minimum	25	24	12
Maximum	42	41	33

¹ Details in writer's "Physiological and Medical Observations," etc., p. 143 et seq. The tests on the Indians were equally made by the same method and instrument.

² All records in kilograms.

As to the relation of strength with stature, the 15 healthy tallest Kharga men gave the average right hand pressure of 36.5 kg., the 20 shortest ones 33.9 kg., a decided advantage for those of higher stature. Everything indicates that those of the lowest statures at the Oasis are also those who present a greater general weakness, as well as subnormal metabolism, while with those of the highest statures these conditions are reversed. From this it seems safe to conclude that short and tall statures, in this locality at least, are not pure racial characteristics, but that they are largely due to the state of health and nourishment of the individual during growth, and hence to environment; and it can be assumed that when the economic and hygienic conditions of the Oasis shall ameliorate, as they are bound to do with the advance of civilization, the population will respond to an important degree by better physical development.

RÉSUMÉ OF THE PRINCIPAL PHYSIOLOGICAL OBSERVATIONS

The Kharga Oasis men show on the average, in comparison with the European whites, a perceptibly faster pulse; a slightly faster respiration; a perceptibly lower temperature; and decidedly lower muscular power.

The differences in these functions according to age and stature follow in general the same laws as among whites, American Indians, and other races.

The principal defects observed in the Kharga natives in these tests are evidently not anthropological characteristics, but local and temporary phenomena, attributable in the main to the immediate environment, particularly nutrition, and are in all probability largely remediable.

7. OBSERVATIONS ON THE BODY

COLOR

The skin of the Kharga natives, like that of the Egyptians of the Valley, is predominantly more or less brown. The color is, in the main, quite the same as that of the American Indian of the moderate zones. Individually it ranges from tawny and light brown to medium brown; darker shades in those who show no evidence of negro mixture are rare. The records show that lighter shades of yellow-brown or brown existed in 18 per cent; moderate brown in 81 per cent, and dark brown in but 1 per cent of the men examined. The secondary shadings of different parts of the body are, so far as

observed, in no way particular, and the exposed parts, as elsewhere, are generally darker than those habitually covered. On the head, which is always covered, the skin is occasionally nearly as white as in brunet Europeans. The color of the eyes is generally medium to dark brown.

HAIR

The hair is as a rule black, and in those who are not mixed with the negro it is generally straight or approaching straight. It runs thus in 88 per cent of the men examined; in 6 per cent it was black and distinctly wavy; in 5 per cent black with a tendency to curl; and in 1 individual it was dark brown and straight. In women, where the hair is much longer (many of the men clip the hair short or even shave the head), it is, so far as could be observed, generally more or less wavy, with occasional tendency to curl; in children it is straight, wavy or slightly curly. The Coptic mummies at El Baguat showed in general hair that was black and straight to moderately wavy. A decidedly curly hair in Kharga natives was as a rule found associated with thick lips and other negro features. It appears, in fact, as if the tendency to curly hair was one of the most lasting effects in the progeny of one-time negro admixture.

Grey hair, to any appreciable extent, was only seldom noticed before the 40th year, and occasionally men of 48-50 years of age showed hair that was nearly all black. At 55 and above greyness was as a rule advanced.

As to beard, conditions were found as follows: In 94 per cent of the men examined the color of the hair on the face was black, while in 6 per cent it was dark but not quite black; and in a number of additional cases the moustache showed a trace lighter than the rest of the beard which was black. The quantity of the moustache was fair in 8, moderate in 49 and scanty in 43 per cent of the individuals; the chin beard was fair in quantity in 5, moderate in 30, scanty in 49 and absent (naturally) or nearly so in 16 per cent of the cases. The total absence of beard was noticed however, with a very few exceptions, only in those below 30 years of age. In form the hair of the face, when longer, shows generally more or less tendency towards waviness. This is especially true of the chin beard and of the more distal parts of both beard and moustache. Greyness of moustache was found to begin somewhat later and to be generally less advanced than that of the hair of the scalp; that of the chin beard was seen to begin about the same time as that of the head.

No instance was found of a well developed baldness of the top of the head; in 26 of the men (17 per cent) there was more or less of a loss in the front, so that the original height of the forehead could not be determined. In no case, however, did this calvitia reach near to bregma.

Abnormal hairiness of the body was not noticed in any instance.

FEATURES OF THE HEAD

The head was observed to be generally of moderate size. No instance of either artificial or pathological deformation came to notice. In shape it is generally oblong and with either an elliptical, somewhat ovoid, or pentagonal outline of the *norma superior*. On the whole the head of the average Kharga native is much like that of the ordinary non-negroid Egyptian, and lacks all distinctive negro features.

The forehead in 86 per cent of the cases was found comparable with the average form in the whites; in 5 per cent it was high (naturally), in 6 low and in 2 per cent sloping.

The supraorbital ridges were large in 1 case; they were about as developed as in average white males in 27 per cent, of a submedium to very small development in 71 per cent, and wholly absent in one of those examined.

The occiput was in no case especially protruding, the external occipital protuberance or ridges in no case pronounced.

The ears were found to be generally fairly well formed, lying normally near the head or but moderately abstanding, and both in size and shape quite like those of whites, but unlike the characteristic ear of the negro,¹ which only appeared occasionally in the mixed-bloods. The separation of the lobule is occasionally more or less deficient.

FACIAL FEATURES

The outline of the face is generally near elliptical or ovoid, with the lower portion occasionally angular.

The eyes, or more properly eye-slits, were in 97 per cent of the examined horizontal or nearly so, as in Europeans; in 1 case they were perceptibly oblique with the distal canthi higher, and in 2 cases they were oblique with the distal canthi lower than the proximal.

The nasion depression was but slight in 12, moderate or medium

¹ See Hrdlička, A.: *Anthropological Investigations on One Thousand White and Colored Children*, etc. 8°, New York, 1899.

(as compared with whites) in 86, and pronounced in 2 per cent of the cases.

The nose is generally not of great size or prominence. The bridge was found straight in 42, slightly convex in 41, convex in 3, concavo-convex in 10 and slightly concave in 4 per cent. It may be said then to be in general straight or slightly convex.

The nasal septum is prevalently horizontal or somewhat inclined downward. It was horizontal in 62 per cent, slightly inclined downwards (distal end lower than proximal) in 18, very perceptibly inclined downward in 9, and slightly inclined upward (distal part higher than proximal with head in natural position) in 11 per cent of the cases.

The alæ of the nose are seldom broad and in the unmixed never show the characteristics of those in the negro.

The lips were found to be of about medium size, or not exceeding the ordinary dimensions of lips in white males, in 83 per cent of the men, while they were perceptibly to moderately thicker in 17 per cent.

Prognathism on the whole is somewhat more marked than in the average Europeans, but in a pronounced form is rare; the conditions in this respect were about as the mean in white men, or but slightly more marked, in 78 per cent, moderately more pronounced in 19 per cent, and decidedly more pronounced than in average whites in 3 per cent of those examined.

The chin was in 85 per cent of the cases of medium proportions and form, compared with the whites; in 13 per cent of the individuals it was more or less angular or "square," in 1 man it was unusually pointed and in 1 unusually long. The angles of the lower jaw showed in 84 per cent of the individuals medium development, in 14 per cent they were above average in size or prominence, and in 2 per cent they were perceptibly below such average.

The malar regions showed about medium size (as compared with whites) and moderate prominence in 78 per cent, were sub-medium in both these features in 4 per cent and above medium in 18 per cent of the cases.

Among the 150 men who were specially examined, there was no one with any marked asymmetry of face or with any anomalies of importance.

The neck is usually of medium development and quite cylindrical; in the younger men it is frequently rather high.

BODY AND LIMBS

So far as could be determined without undressing the subjects, 96 per cent of them presented a body of medium development and without marked abnormalities; none were obese, but 4 per cent were unusually thin, though not decrepit. No special differences were observed in the various parts of the body from the normal or most common type in whites.

The hands and feet are generally fairly well formed and not large. No anomaly of fingers came to notice. The fingers and toes are not long. The toes were normal in 95 per cent, in 5 per cent of the individuals they presented some peculiarities.¹ They were only very rarely seen markedly separated, as they are frequently in the Indian. In those who work and go bare-footed the toes are generally thickened.

CONCLUDING REMARKS ON NON-INSTRUMENTAL OBSERVATIONS

The features of the Kharga natives are in general much like those of the fellaheen of the Valley who do not show an admixture with the negro. Nevertheless the physiognomy of the Oasis men seems somewhat distinctive. They could be easily told from the often finely shaped Berberine or Barabra of upper Egypt, and the student comes to believe that he could recognize them even from the natives of the neighboring parts of the valley; but the differences would not be easy to define. The Egyptians of the Valley, however, present a larger number of individuals of a decidedly semitic type of face. Beyond the Valley, the physiognomy of the Oasis people is close to that of the Arab and the north African non-negro native in general.

The various characteristics of the head, face, and body, barring the color, when closely scrutinized, are found to be closely related to those of the white race and to have nothing in common with what is distinctive of the negro.

8. MEASUREMENTS

STATURE

The height of the Kharga Oasis men is unusually small, averaging barely 163.8 cm. (5 ft. 4½ in.). The exact conditions were as follows:

¹ The principal anomalies were as follows: (a) The 4th and 5th left toes, especially the latter, turned outward and downward; (b) the 5th left toe is diminutive; and (c) the great toe shows a small toe-like (nailless) growth on its inner side and near the end.

KHARGA OASIS, MEN: STATURE

Number of individuals measured: 150.

Average: 163.8 cm.¹ (1st 50: 164.3; 2d 50: 162.3; 3d 50: 164.9 cm.)

Median 164.0 cm. Modes: 161.5 (161-162) and 168 (167-168) cm.

Minimum: 150.6 cm. Maximum: 174.6 cm.

Table of frequencies:

	150.1-152.5 cm.	152.6-155 cm.	155.1-157.5 cm.	157.6-160 cm.	160.1-162.5 cm.	162.6-165 cm.	165.1-167.5 cm.	167.6-170 cm.	170.1-172.5 cm.	172.6-175 cm.
Number of cases.....	3	2	9	23	24	25	30	21	8	5
Per cent.....	2.0	1.3	6.0	15.3	16.0	16.7	20.0	14.0	5.3	3.3

¹ Probable error = ± 0.269 ; standard deviation, σ , = 4.89, ± 0.190 ; coefficient of variability, C , = 2.987, ± 0.116 .

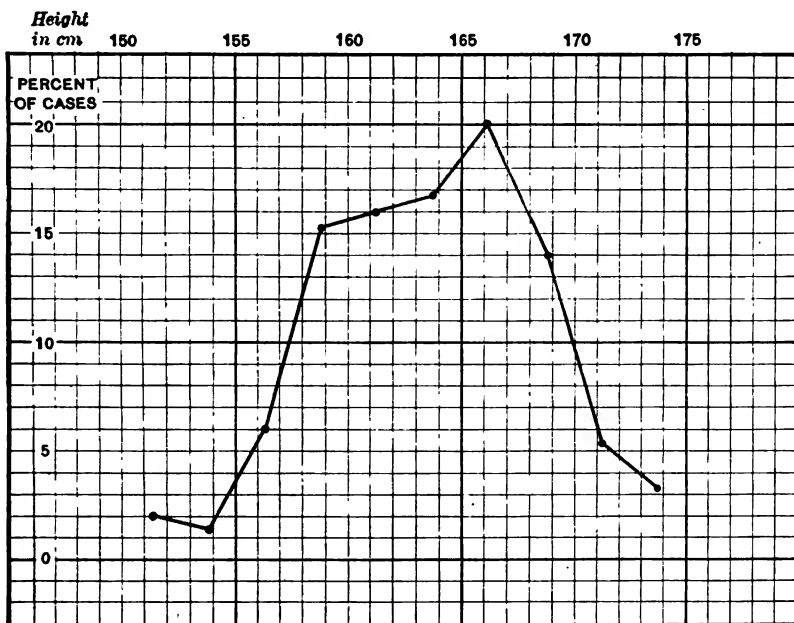


FIG. 2.—Curve showing the distribution of statures among 150 adult males of the Kharga Oasis.

The range of variation extends over 24 cm., or ± 0.073 per centimeter of the average, which can not be regarded as excessive. The distribution of the statures, however (fig. 2), is somewhat peculiar. If considered centimeter by centimeter, it gives two separate modes well apart. These conditions are probably not without

significance, but to determine their exact bearing is difficult. They may be anthropological in nature, due to admixture of two or more elements outside of the negro, or they may be physiological, connected especially with the prevalent defective nutrition in the Oasis. Perhaps they are the complex result of both these factors. Problems like this can usually be solved only by long extended and comparative investigations.

There are some means of contrasting the stature measurements of the Kharga people with those of the Valley Egyptians. In 1904 E. Chantre published a work on anthropological research in Egypt¹ and the following male statures are recorded: 127 Copts—166.0 cm.; 91 Fellaheen—168.4 cm.; 134 Bedouins—167.8 cm.; and 223 Bedjah (Ababdeh, Barabra, Bichariet)—167.6 cm. All these means are very perceptibly higher than those of the Kharga natives. Other measurements on an extensive series of Egyptians and Soudanese conscripts have been published by Myers,² but as these were men selected for the military on the basis of good stature and strength, their height records are of no value in this connection.

HEIGHT SITTING

The actual measurements are given in the following list. They are of less importance than the comparisons to be given later. They give a relatively solid curve of distribution (fig. 3). The extent of variation is slightly higher, when compared to a unit of measurement, than that of the total height of the body.³ No data on the Valley Egyptians are in this respect available for comparison.

¹ *Recherches anthropologiques dans l'Afrique orientale: Egypte.* 4°, Lyon, 1904.

² Myers, Chas.: *Contributions to Egyptian Anthropology: Tatuing.* Journal Anthropological Institute, Vol. 33, January-June, 1903, pp. 82-89. *The Comparative Anthropometry of the most Ancient and Modern Inhabitants.* Ibid. Vol. 35, January-June, 1905, pp. 80-91. III. *The Anthropometry of the Modern Mahommedans*; IV. *The Comparison of the Mahommedans with the Copts and the "Mixed" Group.* Ibid. Vol. 36, July-December, 1906, pp. 237-271. *Contributions to Egyptian Anthropology.* Ibid. Vol. 28, January-June, 1908, pp. 99-147.

³ Variability per centimeter: stature ± 0.073 ; height sitting ± 0.091 .

KHARGA OASIS, MEN: HEIGHT SITTING

Number of individuals measured: 150.

Average 84.0 cm.¹ (1st 50: 84.7 cm.; 2d 50: 82.7 cm.; 3d 50: 84.5 cm.)

Median: 84.1 cm. Modes: 84.0 (83.1-85.0) cm.; 86.5 (86.1-87.0) cm.

Minimum: 75.1 cm. Maximum: 90.4 cm.

Table of frequencies:

	Below 78.0 cm.	78.1-80 cm.	80.1-82 cm.	82.1-84 cm.	84.1-86 cm.	86.1-88 cm.	88.1-90 cm.	90.1 and above
Number of cases.....	2	11	28	33	35	31	9	1
Per cent	1.3	7.3	18.7	22.0	23.3	20.7	6.0	0.7

¹ Probable error ± 0.155 ; standard deviation, σ , = 2.820, ± 0.110 ; coefficient of variability, C , = 3.357, ± 0.131 .

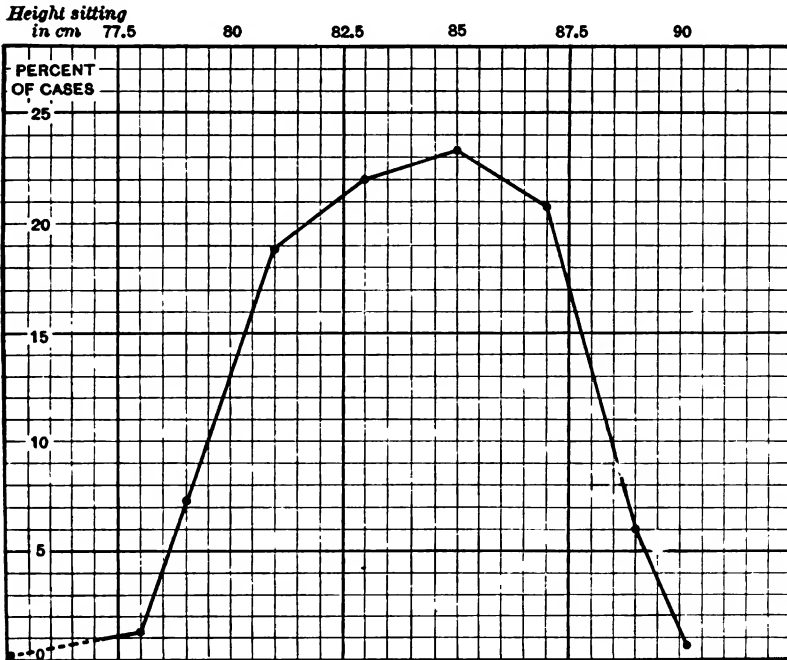


FIG. 3.—Curve showing the distribution of height above ischia (height sitting) among 150 adult males of the Kharga Oasis.

The relation of the length of that portion of the body above (or that below) the lowest level of the ischia to total stature is a feature of considerable anthropological interest. The Kharga natives show in this respect the conditions given in the next table.

**KHARGA OASIS, MEN: PERCENTAL RELATION OF HEIGHT SITTING,
TO HEIGHT STANDING**

Number of individuals: 150.

Average: 51.26.¹ (*Sub ischia* = 48.74.)

Median: 51.5. Mode: 51.5.

Minimum: 47.3. Maximum: 54.3.

Table of frequencies:

	47.1-48	48.1-49	49.1-50	50.1-51	51.1-52	52.1-53	53.1-54	54.1-55
Number of cases.....	1	8	9	40	51	30	10	1
Per cent.....	0.7	5.3	6.0	26.7	34.0	20.0	6.7	0.7

¹ Probable error = ± 0.071 ; standard deviation, σ , = 1.281, ± 0.050 ; coefficient of variability, C , = 2.499, ± 0.097 .

According to older sources, the following proportions of the upper and lower part of the body, as obtained by measuring the height sitting, have been found in different groups of whites, etc.:

PERCENTAL VALUE OF HEIGHT SITTING, IN REGARD TO STATURE

(After different authors, from Topinard, *Éléments d'Anthrop. gén.*, p. 1070.)¹

	Height sitting	Below ischia
88 Sardes (d'Hercourt)	54.9	(45.1)
100 Esthonians (Grube)	53.7	(46.3)
100 Keltic French (Collignon)	52.6	(47.4)
100 Cymric French (Collignon)	52.2	(47.8)
329 Americans (white) of 21 yrs. of age (B. A. A. S. 1879)	52.7	(47.3)
364 English, of 21 yrs. of age (B. A. A. S. 1879)	52.4	(47.6)
60 Lithuanians (Waeber)	51.9	(48.1)
100 Livonians (Waldhauer)	51.4	(48.6)
100 Jews (Blechmann)	51.5	(48.5)
184 Kabyles (Prengruber)	51.4	(48.6)

The most interesting and probably anthropologically significant feature in regard to the Kharga natives, is their proximity in the characteristic under consideration to the Jews, and especially to the Kabyles. Such relation is not, however, always racial in nature, for it may be merely a like result of similar environmental agencies, particularly poor nutrition.

Among the Indians, the typically dolichocephalic Pima gave the writer, for the height above ischia, 52.9 per cent; for that below the

¹ Compare also the results obtained on the dead by W. Pfitzner, *Social-anthropologische Studien, Zeitschrift f. Morphologie and Anthropologie*, Vol. 1, 1899 p. 325 et seq.; Vol. 3, 1901, p. 485 et seq.

ischia 47.1 per cent of the total height; while among the typically brachycephalic Apache these proportions were respectively 53.2 and 46.8 per cent.¹ In twenty apparently full blood male American negroes, measured by the writer, the same proportions were respectively 51.4 and 48.6 per cent.

The range of variation in the relative proportions of the height above and that below the ischia in the Kharga natives is remarkable. Each of these proportions is evidently influenced by numerous factors which do not act with equal effect on the other.

A research into the influences capable of modifying these proportions was possible in one important direction: the effects of the lowest and the highest statures. It has been shown already that the lowest statures, where not due to senility, stand often in close connection with weaker muscles and prolonged general poor nutrition, while in the case of the highest statures, the case is often the reverse. And the lowest statures, as will be shown in the next table, are also frequently accompanied with a subaverage relative length of the lower limbs, whereas in the tallest individuals the length *infra ischia* is perceptibly above the average. These conditions suggest that the main causative agencies of low statures, and probably above all chronic poor nutrition, affect adversely the length of the lower limbs more than that of the rest of the body, while favorable conditions of growth, especially, in all probability, good nutrition, cause in general a proportionately greater development in length of the lower limbs. The body *supra ischia* is the more stable portion, as regards length, of the human organism. There are indications that these conditions are not restricted to the Kharga natives, but will find a much wider anthropological application.

¹ "Physiological and Medical Observations, etc.," p. 112 et seq.

**KHARGA OASIS, MEN: HEIGHT AND HEIGHT SITTING IN THE SHORTEST
AND TALLEST INDIVIDUALS**

Stature 157.5 cm. and less				Stature 170 cm. and more.			
Stature	Height sitting	Percental relation of height sitting to stature	Percental relation of the parts <i>infra</i> ischia to stature	Stature	Height sitting	Percental relation of height sitting to stature	Percental relation of the parts <i>infra</i> ischia to stature
<i>cm.</i>				<i>cm.</i>			
150.6	79.8	53.0	47.0	170.5	85.6	50.2	49.8
152.3	80.4	52.8	47.2	170.7	89.5	52.4	47.6
152.3	80.3	52.7	47.3	171.1	88.5	51.7	48.3
153.6	81.7	53.2	46.8	171.3	87.4	51.0	49.0
154.5	81.0	52.4	47.6	172.2	87.6	50.9	49.1
155.2	81.2	52.3	47.7	172.4	84.8	49.2	50.8
155.7	81.4	52.3	47.7	172.4	87.1	50.5	49.5
155.7	75.1	48.2	51.8	172.5	84.8	49.2	50.8
155.7	78.6	50.5	49.5	172.7	88.3	51.1	48.9
155.9	79.9	51.2	48.8	172.7	88.3	51.1	48.9
156.0	80.1	51.3	48.7	173.8	85.5	49.2	50.8
156.3	80.4	51.4	48.6	174.5	90.4	51.8	48.2
156.5	79.0	50.5	49.5	174.6	85.8	49.1	50.9
157.5	82.1	52.1	47.9				
Averages (14 individuals):				Averages (13 individuals):			
154.8	80.1	51.7	48.3	172.4	87.4	50.6	49.4

As to the effect of age on the relative proportion of the upper and lower parts of the body, the Kharga series shows nothing definite; but it includes no really senile individuals. It seems safe to assume that, due principally to the frequent greater bending of the spine in the aged, the average value of the height above ischia in relation to that below the ischia diminishes in advanced age. This principle is, of course, applicable to all groups of mankind, not merely the Egyptians.

THE HEAD

Length of Head

The maximum length of the head averages 18.9 centimeters, which is a fair dimension. Its range of variation extends over 28 mm., equaling ± 0.74 per each cm. of the average, which is not excessive.

The curve of distribution of the measurement (fig. 4) is somewhat unusual.

KHARGA OASIS, MEN: DIAMETER ANTERO-POSTERIOR OF MAXIMUM HEADNumber of individuals measured: 150.¹Average: 18.9 cm.² (1st 50: 19.0; 2d 50: 18.8; 3d 50: 18.9 cm.)

Median: 18.9 cm. Mode: 19.0 cm.

Minimum: 17.6 cm. Maximum: 20.4 cm.

Table of frequencies:

	17.6 cm.	17.7-17.8 cm.	17.9-18 cm.	18.1-18.2 cm.	18.3-18.4 cm.	18.5-18.6 cm.	18.7-18.8 cm.	18.9-19 cm.	19.1-19.2 cm.	19.3-19.4 cm.	19.5-19.6 cm.	19.7-19.8 cm.	19.9-20 cm.	20.1-20.2 cm.	20.3-20.4 cm.
Number of cases	1	3	3	8	10	22	22	30	22	9	9	4	5	1	1
Per cent	0.7	2.0	2.0	5.3	6.7	14.7	14.7	20.0	14.7	6.0	6.0	2.7	3.3	0.7	0.7

¹ Includes no deformed or pathological heads; and the same applies to the other skull measurements.² Probable error = ± 0.028 ; standard deviation, σ , = 0.5054, ± 0.020 ; coefficient of variability, C , = 2.674, ± 0.104 .**Breadth of Head**

The greatest *breadth* of the head gives the moderate mean of 14.4 cm. It varies to the extent of 25 mm., or 0.088 per each cm. of the average, hence slightly more than the length; the curve of distribution, however (fig. 4), though quite shouldered, is unusually solid.

KHARGA OASIS, MEN: DIAMETER LATERAL MAXIMUM OF HEAD

Number of individuals measured: 150.

Average: 14.14 cm.¹ (1st 50: 14.14; 2d 50: 14.06; 3d 50: 14.22 cm.)

Median: 14.2 cm. Mode: 14.4 cm.

Minimum: 12.8 cm. Maximum: 15.3 cm.

Table of frequencies:

	12.8-12.9 cm.	13-13.1 cm.	13.2-13.3 cm.	13.4-13.5 cm.	13.6-13.7 cm.	13.8-13.9 cm.	14-14.1 cm.	14.2-14.3 cm.	14.4-14.5 cm.	14.6-14.7 cm.	14.8-14.9 cm.	15-15.1 cm.	15.2-15.3 cm.
Number of cases.	1	3	2	7	13	19	25	27	28	14	5	4	2
Per cent	0.7	2.0	1.3	4.7	8.7	12.7	16.7	18.0	18.7	9.3	3.3	2.7	1.3

¹ Probable error = ± 0.025 ; standard deviation, σ , = 0.4507, ± 0.018 ; coefficient of variability, C , = 3.196, ± 0.124 .

Both the length and the breadth of the head augment, as will be seen in the next table, with the height of the body, and they augment at nearly the same ratio. The latter fact indicates that it is in

**KHARGA OASIS, MEN: RELATION OF LENGTH AND BREADTH OF
HEAD TO STATURE**

Length and breadth of head in the lowest and highest statures

14 shortest individuals of the series			13 tallest individuals of the series		
Stature	Length of head	Breadth of head	Stature	Length of head	Breadth of head
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>
150.6	18.5	13.9	170.5	19.2	13.1
152.3	18.0	13.35	170.7	19.4	13.0
152.3	18.9	12.9	171.1	18.8	13.8
153.6	18.2	12.7	171.3	19.9	14.15
154.5	18.5	12.5	172.2	19.0	13.3
155.2	19.2	13.7	172.4	18.6	12.8
155.7	19.3	13.5	172.4	19.9	13.55
155.7	19.6	13.05	172.5	18.4	13.55
155.7	19.4	13.25	172.7	19.0	13.05
155.9	18.2	13.0	172.7	18.9	13.4
156.0	18.8	12.95	173.8	19.0	13.1
156.3	18.2	13.0	174.5	18.3	13.45
156.5	19.5	13.2	174.6	18.7	13.5
157.5	17.7	13.2			

Averages:

154.8	18.7 (17.7-19.6)	13.16 (12.5-13.9)	172.4	19.0 (18.3-19.9)	13.37 (12.8-14.15)
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Stature and breadth of head corresponding to shortest and longest heads

15 shortest heads			15 longest heads		
Length of head	Stature	Breadth of head	Length of head	Stature	Breadth of head
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>
17.6	162.0	13.0	19.6	155.7	13.05
17.7	157.5	13.2	19.6	159.8	13.3
17.7	169.4	12.85	19.6	168.8	13.15
17.8	157.8	12.6	19.6	164.7	13.3
18.0	163.0	12.9	19.7	165.0	13.3
18.0	152.3	13.35	19.8	168.3	14.1
18.0	163.7	12.5	19.8	164.8	13.5
18.1	160.7	13.05	19.8	165.8	13.4
18.1	160.8	13.1	19.9	172.4	13.55
18.1	161.3	13.0	19.9	171.3	14.15
18.2	164.7	13.55	20.0	163.3	13.55
18.2	153.6	12.7	20.0	169.4	13.7
18.2	155.9	13.0	20.0	166.1	13.4
18.2	168.0	12.3	20.1	163.4	13.05
18.2	156.3	13.0	20.4	168.6	13.4

Averages:

18.0	160.5 (152.3- 169.4)	12.9 (12.3-13.55)	19.85	165.8 (155.7- 172.4)	13.64 (13.05- 14.15)
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reality the size of the head and not its length or breadth that is directly correlated with the stature.

The augmentation in both measurements is not exactly proportionate to stature in all its grades, but lags behind as the stature increases, so that while in the shortest men the length and breadth of the head represent respectively 12.1 and 8.5 per cent of the body height, in the tallest men they represent only 11.0 and 7.75 per cent of the same.

Cephalic Index

The *cephalic index* averages 74.83, which characterizes the Kharga people as in general dolicho- and mesocephalic. The extremes extend on one side to hyperdolichocephaly while on the other they barely reach the beginning of brachycephaly, showing that there is but little tendency towards real broad-headedness. The range of variation, 12.7 or ± 0.085 per unit of the average, is not unusual. The curve of distribution (fig. 4) of the index, however, shows two pronounced and well separated points, which exceed considerably any effects of the mathematical probable error and which, considering the number of subjects involved, can not well be regarded as without significance. The tendency towards this double grouping is recognizable in the distribution curves of both the measurements the relation of which is expressed by the cephalic index, but in the latter the condition is especially clear. It is interesting to note that Myers¹ found a very much similar condition in the soldiers from several of the Egyptian provinces, but decided, not warrantably, it seems, that the two peaks of his polygons "were purely due to chance." The two peaks were located in all cases one at 73 and the other at 76-77, which agrees closely with the 72.5 and 75.5 peaks at Kharga.

The writer feels obliged to regard the principal grouping shown by the cephalic index curve or polygon at Kharga as not wholly accidental. It has very probably other causes. These may be racial, in which the condition would express a mixture of two ethnic elements, one more and one less dolichocephalic; or it may be pathological, using this term especially in its extension to various defective conditions that are liable to affect adversely the developments and growth of the organism. The problem is difficult of definite solution from the data at hand. The writer's impression is that in this case it is principally the anthropological factor that is accountable.

¹ Myers, C. S.: Contribution to Egyptian Anthropology; III. The Anthropometry of the Modern Mahommedans. Jour. Anthr. Inst. Vol. 36, 1906, p. 246 et seq.

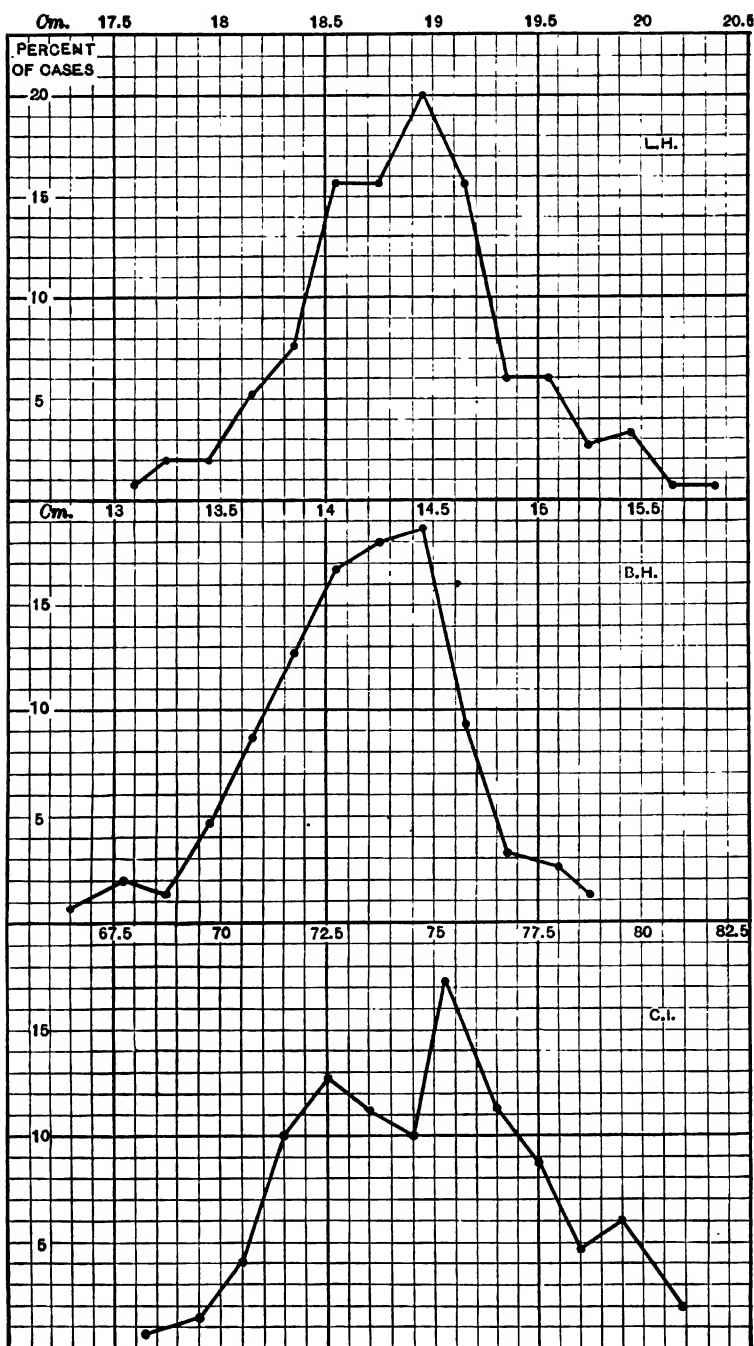


FIG. 4.—Curve showing the distribution of Length of Head (L. H.), Breadth of Head (B. H.) and Cephalic Index (C. I.), in 150 adult males of the Kharga Oasis.

KHARGA OASIS, MEN: CEPHALIC INDEX

Number of individuals: 150.

Average cephalic index: 74.83¹ (1st 50: 74.5; 2d 50: 74.8; 3d 50: 75.2.)

Median: 75.0.*Modes: 72.5 (72.1-73) and 75.5 (75.1-76).

Minimum: 68.2. Maximum: 80.9.

Table of frequencies:

	68.1-69	69.1-70	70.1-71	71.1-72	72.1-73	73.1-74	74.1-75	75.1-76	76.1-77	77.1-78	78.1-79	79.1-80	80.1-81
Number of cases.	1	2	6	15	19	17	15	26	17	13	7	9	3
Per cent	0.7	1.3	4.0	10.0	12.7	11.3	10.0	17.3	11.3	8.7	4.7	6.0	2.0

¹ Probable error = ± 0.146 ; standard deviation, σ , = 2.655, ± 0.103 ; coefficient of variability, C , = 3.544, ± 0.138 .

The length of the head, the breadth of the head and the cephalic index of the men at Kharga show in general a close relation to similar determinations made by Chantre and Myers on the Valley Egyptians, as will be seen from the following comparison:

Subjects	Observer	Head: Length	Breadth	Index
150 Kharga Oasis men	Hrdlička	18.9	14.1	74.9
127 Copts	Chantre	18.85	14.2	75.2
91 Fellaheen	Chantre	19.0	14.2	74.7
44 Copts (soldiers)	Myers	19.3	14.3	74.0
369 Egyptian Moslems (soldiers)	Myers	19.46	14.43	74.3

Myers' subjects, selected in recruiting for their tall stature, give naturally higher absolute values for the length and breadth measurements than the other series, but the index remains much the same as in the other groups; it varies, as seen, only to the extent of 1.2 points in the five series recorded.

The cephalic index of the Kharga men agrees well with that of the Coptic mummies of the Oasis, and also, as will be shown below on one hand with that of the Arabs, and on the other with that of most of the Berbers and other non-negroid north-Africans. Of course it should be borne in mind that the similarity of the cephalic index is of anthropological value only when other important characteristics of the given groups are alike. Such agreement actually exists in the here adduced non-negroid peoples.

MEAN CEPHALIC INDEX IN VARIOUS NORTH AFRICAN GROUPS

(Arranged from data given by Chantre.¹)

Males

Tribes	Observer	No. of individuals	Cephalic index
Arabs of Ougorla (?)	Elisseieff	20	72.00
Arabs of Oran (?)	Bleicher	10	73.21
Arabs of Sinai	Elisseieff	20	73.87
Arabs of Ouled Touarah	Chantre	18	73.30
Arabs of Ouled Ayaideh	Chantre	41 b. s.	74.48
Arabs of Ma'azeh	Chantre	40 b. s.	75.00
Arabs of Alep	Chantre	22	77.05
Berbers of Aures	Elisseieff	10	72.00
Berbers of Chemini	Bertholon	40	72.62
Berbers of Menzel	Bertholon	53	72.79
Berbers of Ouled Harabi	Chantre	20	72.82
Berbers of Kroumirie	Bertholon	358	73.99
Berbers of Hama	Bertholon	64	74.37
Berbers of Djara	Bertholon	14	74.80
Berbers of Medjez-el-Bab	Collignon	16	75.39
Berbers of Chaouias	Faidherbe	15	75.60
Berbers of Palestro	Prengreuber	184	76.04
Berbers of Biskra	Seriziat	180	76.07
Berbers of Mozabit	Amat	50	77.03
Berbers of Kairouan	Collignon	61	77.59
Berbers of Gerba	Bertholon	330	79.94
Ouled Nagama	Chantre	21	75.26
Ouled Aly	Chantre	20	75.39
Ouled Said	Collignon	16	77.79
Beoni-Maguel of Gerba	Bertholon	34	82.24
Ouled Zelofras of Gerba	Bertholon	11	82.50

Height of Head

The *height of the head* measured by the writer throughout his investigations on the living, is that from the line connecting the floor of the auditory canals to the scalp over the bregma. The method relied upon and which gives results somewhat higher than those obtained by the means of Gray's radiometer, is given briefly in the footnote.² Regrettably both Chantre and Myers in their measurements on the Egyptians used other methods, and their results are not comparable with those here recorded.

¹ Recherches anthropologiques dans l'Afrique orientale: Egypte. 4°, Lyon 1904.

² The measurement is obtained by a spreading and a sliding compass. The branches of a suitable *compas d'épaisseur* are introduced well into the auditory meati and allowed to rest on their floor. The expansion of the instrument is noted, with the scale held over the bregma region; the distance from the bregma region to the lower edge of the scale is measured by the rod of the *compas glissière*, and a simple arithmetical process gives the biauricular line-bregma height. With practice the measurement becomes easy, rapid, and at least as reliable as the measure of the same height by any other method. With due care, particularly as to the temperature of the instrument, the branches of the compass in the ears cause but very little discomfort. The writer has used this method now for many years with satisfactory results, and after testing the Gray's radiometer, must prefer it to that instrument.

The conditions shown by this measurement in the Kharga men were as follows:¹

KHARGA OASIS, MEN: HEIGHT OF HEAD

Number of individuals measured: 150.

Average: 13.17 cm.¹ (1st 50: 13.2; 2d 50: 13.1; 3d 50: 13.2 cm.)

Median: 13.2 cm. Modes: 13.0 and 13.4 cm.

Minimum: 12.3 cm. Maximum: 14.1 cm.

Table of frequencies:

	12.3 cm.	12.4-12.5 cm.	12.6-12.7 cm.	12.8-12.9 cm.	13-13.1 cm.	13.2-13.3 cm.	13.4-13.5 cm.	13.6-13.7 cm.	13.8-13.9 cm.	14-14.1 cm.
Number of cases	3	4	14	19	31	32	31	8	6	2
Per cent	2.0	2.7	9.3	12.7	20.7	21.3	20.7	5.3	4.0	1.3

¹ Probable error = ± 0.020 ; standard deviation, σ , = 0.3646, ± 0.014 ; coefficient of variability, C , = 2.762, ± 0.108 .

The average height of the head, based on the above measurements, namely 13.17 cm., corresponds to a somewhat higher basion-bregma height on the skull and indicates that the cranium of the Kharga Oasis natives is relatively of moderate height.

The variation of this dimension extends to 18 mm., which is ± 0.069 for each cm. of the mean measurement.

Several interesting features are revealed by the study of the relation of the height of the head to the form of the head, the height of the body, and the size of the head.

As shown in the following table, the relation between the height of the head and the cephalic index is quite insignificant. The average of the cephalic index in the lowest and the highest heads is very much alike. Among the lowest heads seven are dolichocephalic (below 75), while among those of the highest heads there are eight of that form.

It may then be concluded that in the Kharga men the head form as expressed by the cephalic index is not in any appreciable way dependent on, nor does it affect in any appreciable way, the height of the head.

The relation of stature to the height of the head is more evident. The series of lowest heads shows an association with notably smaller

¹ For results of the measurement on the American Indian, see writer's "Physiological and Medical Observations, etc." p. 118.

average body height than that of the highest vaults. In the former series there are only two individuals (15%) of 1.65 m. in stature or above, while in the equally as large series of the highest heads, there are seven (or nearly 54%) of such statures.

**KHARGA OASIS, MEN: RELATION OF HEIGHT OF HEAD TO STATURE,
FORM OF HEAD AND SIZE OF HEAD**

Cases with smallest height of head (12.65 cm. and below)				Cases with greatest height of head (13.7 cm. and above)			
Height of head	Stature	Cephalic index	Cephalic module	Height of head	Stature	Cephalic index	Cephalic module
<i>cm.</i>	<i>cm.</i>		<i>cm.</i>	<i>cm.</i>	<i>cm.</i>		<i>cm.</i>
12.30	164.5	75.8	15.0	13.70	165.0	73.4	15.7
12.30	168.0	70.3	14.4	13.70	155.2	75.0	15.8
12.35	160.0	71.7	14.8	13.70	163.3	77.4	15.6
12.50	163.7	77.8	14.8	13.70	169.4	73.5	16.1
12.50	154.5	73.5	14.9	13.75	161.6	73.6	15.7
12.55	169.4	72.4	14.8	13.80	169.4	80.1	15.8
12.55	163.5	68.2	14.9	13.80	160.0	71.6	15.7
12.60	157.8	78.6	14.8	13.80	171.1	76.6	15.7
12.60	158.5	75.5	15.2	13.80	159.6	74.3	15.7
12.65	158.7	73.1	14.9	13.85	167.1	74.7	15.7
12.65	162.2	72.1	15.1	13.90	150.6	75.3	15.3
12.65	161.3	77.0	15.2	14.10	168.3	72.7	16.1
12.65	164.1	77.6	15.0	14.15	171.3	72.9	16.2
Averages (13 cases):				Averages (13 cases):			
12.53	162.0	74.1	14.9	13.83	164.0	74.7	15.8

It then appears that higher stature tends in general to be accompanied with an absolutely higher head, than low stature. But there is no direct proportion between the increase in the height of the head and that of the stature. Among the lowest heads the proportional relation between the height of the head and the height of the body is as 1:12.1, while among the highest heads it is only as 1:11.9. This indicates that the growth of the head in height, while it to some extent augments in accord with increasing stature, is in the main subject to other influences.

The most interesting comparison is that between the height of the head and the size of the same. The size of the head is most conveniently represented by the mean cephalic diameter or the cephalic module. Compared with this, it is found that low height of the head corresponds in general to a small head as a whole, and vice versa.¹

¹ See in this connection Boas, F., *The Cephalic Index*, Amer. Anthropologist, N. S., I, 1899, pp. 448-461. All the statements advanced there are, however, not borne out by the present study.

This condition is expressed not only by the averages, but is also illustrated by the fact that in the series of the lowest heads there are no instances of a cephalic module higher than 15.2, while in the series of highest heads there is no module lower than 15.3.

It is further found, however, that in the case of the lowest heads, the average height of the head corresponds to the average cephalic module of the same heads only in the proportion of 84.1 to 100, while in the case of the highest heads that proportion is as 87.6 to 100. This indicates that the height of the head increases faster than the size of the head as a whole, and hence to some extent independently of the same.

As to the relation of the height of the head to the length and breadth of the same, the following data show conclusively that the highest heads are also as a rule absolutely longer and broader than the lowest ones. Under normal conditions, therefore, an exceptional cephalic height is largely a function of the size of the head (which, in turn, as brought out before, stands in close connection with the stature).

KHARGA OASIS, MEN: RELATION OF HEIGHT OF HEAD TO LENGTH AND BREADTH OF SAME

Cases with smallest height of head (12.65 cm. and below)			Cases with greatest height of head (13.7 cm. and above.)		
Height of head	Length of head	Breadth of head	Height of head	Length of head	Breadth of head
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>
12.30	18.6	14.1	13.70	19.2	14.1
12.30	18.2	12.8	13.70	19.2	14.4
12.35	18.7	13.4	13.70	18.6	14.4
12.50	18.0	14.0	13.70	20.0	14.7
12.50	18.5	13.6	13.75	19.3	14.2
12.55	18.5	13.4	13.80	19.1	14.2
12.55	19.2	13.1	13.80	18.6	14.9
12.60	17.8	14.0	13.80	19.4	13.9
12.60	18.8	14.2	13.80	18.8	14.4
12.65	18.6	13.6	13.85	19.0	14.2
12.65	19.0	13.7	13.90	18.5	13.6
12.65	18.7	14.4	14.10	19.8	14.4
12.65	18.3	14.2	14.15	19.9	14.5
Averages (13 cases):			Averages (13 cases):		
12.53	18.53	13.73	13.83	19.18	14.30
Percental relation of height to length and breadth	67.6	91.3	....	72.1	96.7

The mutual relation of the three main diameters, however, does not remain the same from the lowest to the highest heads. With the height it is as 110.4 in the latter to 100 in the former, but with the breadth similar proportions are only 104.2 to 100, and with the length 103.5 to 100. Hence, the highest heads are not only highest absolutely, but also relatively to head length and breadth. The length has evidently lagged behind even slightly more than the breadth (*C. I.* in lowest heads 74, in highest 74.6), but the difference is small and within the possibilities of accidental.

The above conditions do not fall, it seems to the writer, in the category of simple compensations; they are more likely directly connected with the anatomical peculiarities of the vault of the skull and are expressions, in the main, of the law of expansion of the skull in the directions of lesser resistance.

Cephalic Module

The sum of the length, breadth and height of the head, divided by three, gives the mean diameter of the head or the cephalic module,¹

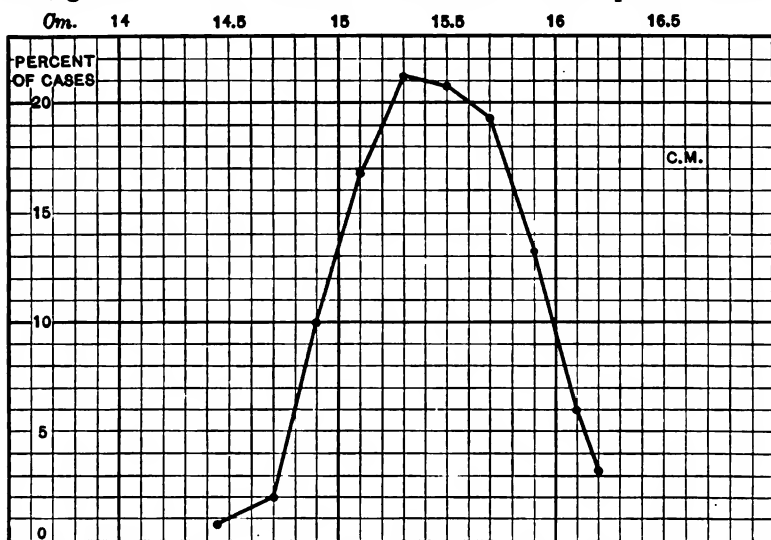


FIG. 5.—Curve showing the distribution of cephalic module (mean diameter of the head) among 150 adult males of the Kharga Oasis.

which, for comparative purposes, represents the size of the head

¹ The term "modulus" was first employed by E. Schmidt, who designated by it (in *Archiv f. Anthrop.*, Vol. 12, 1879-'80, p. 179, and in his "*Anthropologische Methoden*" Leipzig, 1888, p. 212 et seq.) the mean of the three diameters of the skull.

better than the circumference or any other single dimension. When its relations to cranial capacity are better known, the cephalic module will serve capably, particularly in the form of its averages, as an index of the size of the brain.

The conditions shown by the Kharga Oasis men in regard to the cephalic module are given in the next table. The average is perceptibly smaller than that of the central or north Europeans, and also smaller than that of the majority of the tribes of the Indians. Some details concerning this point will be given in succeeding paragraphs. The range of variation is moderate, extending over 17.5 mm., which equals the variability of 0.057 per centimeter of the mean. The distribution of the module gives two fairly separate and distinct modes.

KHARGA OASIS, MEN: CEPHALIC MODULE.¹

Number of observations: 150.

Average: 15.4 cm.² (1st 50: 15.45; 2d 50: 15.31; 3d 50: 15.45 cm.)

Median: 15.38 cm. Modes: 15.25 (15.21-15.3) and 15.55 (15.51-15.6) cm.

Minimum: 14.43 cm. Maximum: 16.18 cm.

Table of frequencies:

	Below 14.6 cm.	14.61-14.7 cm.	14.71-14.8 cm.	14.81-14.9 cm.	14.91-15.1 cm.	15.01-15.1 cm.	15.11-15.2 cm.	15.21-15.3 cm.	15.31-15.4 cm.
Number of cases.	1	1	2	5	10	10	15	17	15
Per cent	0.7	0.7	1.3	3.3	6.7	6.7	10.0	11.3	10.0

	15.41-15.5 cm.	15.51-15.6 cm.	15.61-15.7 cm.	15.71-15.8 cm.	15.81-15.9 cm.	15.91-16 cm.	16.01-16.1 cm.	16.11-16.2 cm.
Number of cases.....	13	18	15	14	6	3	2	1
Per cent.....	8.7	12.0	10.0	9.3	4.0	2.0	1.3	0.7

¹ Diameter antero-posterior max. + diameter lateral max. + auricular line — bregma height

3

² Probable error = ± 0.018 ; standard deviation, σ , = 0.3312, ± 0.013 ; coefficient of variability, C , = 2.151, ± 0.084 .

The size of the head, expressed by the module or in any other manner, possesses in the whites and in other races, as is well known, certain relations to stature. This relation is not the same for all the different statures found in any group, nor is it equally proportionate to

the different grades of stature. In general the head shows larger size the more considerable is the height of the body, and vice versa; however, in individuals above the average in stature the relative size of the head lags behind the body height, while in those of statures below the average the body height decreases in a more rapid ratio than the size of the head. The short men or women of any racial group, therefore, may be expected to possess heads absolutely smaller, but relatively to stature larger, than the tall individuals.

Precisely such conditions as outlined above are shown by the Kharga natives. They appear clearly in the succeeding tables, the first of which gives the average head-stature index, with its range of variation, in this series of Egyptians, while the second exhibits the variation of the index with that of stature.

KHARGA OASIS, MEN: THE HEAD-STATURE INDEX, OR PER-MILLE RELATION OF CEPHALIC MODULE (MEAN CRANIAL DIAMETER) TO STATURE (STATURE=1000)

Number of observations: 150.

Average: 94.0.¹ (1st 50: 94.0; 2d 50: 94.3; 3d 50: 93.7.)

Median: 94.1. Mode: 94.5 (94.1-95).

Minimum: 85.9. Maximum: 101.8.

Table of frequencies:

	85.1-86	86.1-87	87.1-88	88.1-89	89.1-90	90.1-91	91.1-92	92.1-93	93.1-94
Number of cases.	1	..	6	1	5	10	16	16	19
Per cent.....	0.7	..	4.0	0.7	3.3	6.7	10.7	10.7	12.7

	94.1-95	95.1-96	96.1-97	97.1-98	98.1-99	99.1-100	100.1-101	101.1-101.8
Number of cases.....	21	18	14	9	4	5	1	4
Per cent.....	14.0	12.0	9.3	6.0	2.7	3.3	0.7	2.7

¹ Probable error = ± 0.169 ; standard deviation, σ , = 3.066, ± 0.119 ; coefficient of variability, C , = 3.258, ± 0.127 .

The average head-stature index of the Kharga men with the mean body height of 163.8 cm., namely 94.0 (94 mm. of body height to each centimeter of the mean head diameter), is about equal to that of male whites of 170 cm. in stature (according to the writer's obser-

vations) but is smaller (by about 2 points) than that of white men of the same body height as these Egyptians. It is even slightly smaller (by about 1 point) than the average in the American Indian.¹ The head of the Kharga native is therefore both absolutely and relatively rather small.

**KHARGA OASIS, MEN: CEPHALIC MODULE IN THE SHORTEST, MEDIUM
AND TALLEST INDIVIDUALS**

Stature below 158 cm.		Stature 163.1-165 cm.		Stature above 170 cm.	
Stature	Per mille relation of cephalic module to stature	Stature	Per mille relation of cephalic module to stature	Stature	Per mille relation of cephalic module to stature
150.6	101.8	163.1	92.8	170.5	91.9
152.3	101.1	163.2	97.6	170.7	92.4
152.3	99.9	163.3	98.3	171.1	91.6
153.6	97.2	163.3	95.3	171.3	94.5
154.5	96.2	163.4	97.0	172.2	98.0
155.2	101.6	163.4	96.2	172.4	87.8
155.7	100.3	163.5	91.4	172.4	92.1
155.7	101.5	163.6	93.0	172.5	89.7
155.7	99.7	163.7	90.6	172.7	91.3
155.9	97.5	164.0	94.1	172.7	90.0
156.0	95.6	164.1	91.7	173.8	88.4
156.3	96.4	164.3	92.4	174.5	87.8
156.5	99.2	164.4	93.6	174.6	87.6
157.5	92.9	164.5	91.2		
157.6	97.1	164.7	93.6		
157.8	93.8	164.7	95.5		
		164.8	94.6		
		164.8	94.5		
		164.8	95.7		
		165.0	95.6		
		165.0	95.0		
Averages (16 individuals)		(21 individuals)		(13 individuals)	
155.2	98.2	164.1	94.3	172.4	90.5

The second table shows the effects of stature on the size of the head among the Oasis men themselves. These effects are seen to be pronounced and quite uniform; there is, of course, some individual variation, but it is small. In general the higher the stature, the

¹Six groups of the latter show the following conditions:

	Average stature	Average cephalic module	Head-stature index
1. 50 Otomi men	159.3	15.5	97.3
2. 50 Aztec men	161.0	15.4	95.8
3. 50 Tarasco men	163.1	15.5	95.0
4. 53 Cora men	164.1	15.8	96.3
5. 50 Apache men	170.0	16.0	94.0
6. 53 Pima men	171.8	15.9	92.3
(306) Mean.....	164.9	15.7	95.1

larger is the head absolutely, but the smaller relatively. If we take the mean stature and mean cephalic module as basis of comparison, we see that in advancing from these in either direction the changes in stature are more rapid than those of the head. As a result of this as we advance with stature above the mean, the head-stature index gradually diminishes, while if we progress below the mean body height, it gradually increases. Thus, as already stated, the shortest men have a head absolutely smaller but relatively to stature larger than the tallest.

The table under consideration and a still closer analysis of the data reveal further that the diminution of the head-stature index from the mean, as well as its augmentation, go on with a fair regularity and that the change averages, in well preserved adults, approximately 0.45 mm. (of the mean head diameter) for each 1.0 cm. of the stature. This 0.45 may well be regarded as the mean, stable, *differential quotient* between a regular theoretical and the actual increase of head size in proportion to stature.

The main conditions dealt with in the preceding paragraphs are, so far as the writer can ascertain, not peculiar to the Kharga natives. A similar variation of the head-stature index, and a similar value of the head-stature differential quotient, occur in the Indians and also in whites.

Regrettably, there are no means of direct comparison in this respect of the Kharga natives with the Valley Egyptians. Chantre's data are not detailed enough, besides which his head height is generally so low that it must have been measured by a method unlike that of the writer and can not be utilized for the determination of the cephalic module comparable with that used in this paper. Myers' data on the Egyptian soldiers, on the other hand, apply, as already mentioned, to men selected for their stature; moreover, Myers has measured the height of the head from the bi-meatus line to maximum elevation of the vault measurement, which on the average is about 11 mm. in excess of the bi-meatus-bregma height measured by the writer. Nevertheless it is possible to make some indirect collation between the two series of subjects, resulting as follows:

	Length of head	Breadth of head	Height of head (bi- meatus line to bregma)	Cephalic module
Egyptian soldiers from the Valley (Myers) of average stature above 170 cm.....	19.5	14.4	about 13.5	about 15.8
Male Egyptians from the Kharga Oasis (H.) of aver- age stature above 170 cm....	19.0	14.4	13.36	15.6

The above determinations, however imperfect, seem to indicate that the head of the Kharga native is even slightly smaller than that of the Valley Egyptian; the differences in this regard between the Oasis and Valley Egyptians are, however, as also indicated by Chantre's data, not very material.

Another point especially inquired into in connection with the cephalic module was its relation to the form of the head, as expressed by cephalic index. The interesting results are given below. They show that in this particular ethnic group there is, on the average, a perceptible difference in the size of the head between those of the lowest and those of the highest cephalic index and that the difference is in favor of the latter. This agrees well with what was indicated by some of the foregoing observations brought out in this paper.

KHARGA OASIS, MEN: RELATION OF SIZE OF HEAD, AS EXPRESSED BY THE MEAN CEPHALIC DIAMETER, OR MODULE, TO THE FORM OF HEAD AS SHOWN BY THE CEPHALIC INDEX

Head Forms Corresponding to Smallest and Largest Sizes of Head

20 lowest modules: 15.0 cm. and below		17 highest modules: 15.8 cm. and above	
Cephalic module	Corresponding cephalic index	Cephalic module	Corresponding cephalic index
<i>cm.</i>		<i>cm.</i>	
14.43	70.3	16.18	72.9
14.63	73.4	16.13	73.5
14.78	78.0	16.13	71.6
14.80	78.6	16.10	72.7
14.82	72.4	16.05	73.0
14.82	71.7	15.97	72.5
14.83	77.8	15.93	75.4
14.87	79.6	15.93	73.7
14.87	73.5	15.88	71.4
14.92	69.1	15.87	78.9
14.93	75.1	15.87	80.0
14.93	76.4	15.85	71.6
14.93	75.4	15.85	80.9
14.95	68.2	15.82	75.8
14.95	73.1	15.80	75.6
14.97	75.0	15.80	79.8
14.98	71.3	15.80	77.1
15	75.8		
15	72.0		
15	70.7		
Averages:			
14.87 (14.43-15.0)	73.9 (68.2-79.6)	15.94 (15.80-16.18)	75.1 (71.4-80.9)

**KHARGA OASIS, MEN: RELATION OF SIZE OF HEAD, AS EXPRESSED BY THE
MEAN CEPHALIC DIAMETER, OR MODULE, TO THE FORM OF
HEAD AS SHOWN BY THE CEPHALIC INDEX**

*Sizes of Head Corresponding to Most Oblong and to Most Rounded Head
Shapes*

22 lowest cephalic indices: below 72.0		19 highest cephalic indices: above 78.0	
Cephalic index	Corresponding cephalic module	Cephalic index	Corresponding cephalic module
	<i>cm.</i>		<i>cm.</i>
68.2	14.95	78.1	15.32
69.1	14.92	78.4	15.47
69.6	15.15	78.5	15.40
70.2	15.23	78.6	14.80
70.3	14.43	78.8	15.48
70.7	15.02	78.9	15.87
70.7	15.77	78.9	15.03
70.9	15.52	79.1	15.20
70.9	15.08	79.4	15.77
71.2	15.25	79.4	15.22
71.3	14.98	79.5	14.87
71.3	15.53	79.5	15.32
71.4	15.88	79.7	15.42
71.6	15.13	79.8	15.48
71.6	15.13	79.8	15.80
71.6	16.13	80.0	15.87
71.6	15.85	80.1	15.77
71.6	15.22	80.7	15.25
71.6	15.70	80.9	15.85
71.7	14.82		
71.8	15.23		
71.8	15.60		
Averages:			
70.9 (68.2-71.8)	15.30 (14.82-16.13)	79.4 (78.1-80.9)	15.43 (14.80-15.87)

THE FACE

Chin-Hair Line Height

The total height of the face in the Kharga men averages 17.6 cm., which, compared with the same dimensions in other races, is rather low.¹ The range of variation is quite large; this is due partly to the inclusion in the measurement of the forehead, which varies independently of the face proper. The variation amounts to 51 mm., or ± 0.145 per cm. of the average, which is more than shown by any of the principal head measurements. The curve of distribution (fig. 6) even when condensed, is not entirely uniform.

¹ Compare for this and other face measurements especially Weisbach, A., *Körpermessungen verschiedenen Menschenrassen*, Supplement z. Zeitschr. f. Ethnologie, Vol. 9, 1877; 8° Berlin 1878; Pfitzner, W.: *Social-anthropologische Studien Zeitschr. f. Morphol. und Anthropol.*, Vol. 1, 1899, and Vol. 3, 1901; and Myers, Chas. S., *Contribution to Egyptian Anthropology*, Jour. Anthr. Inst., Vol. 38, 1908, (detailed measurements only).

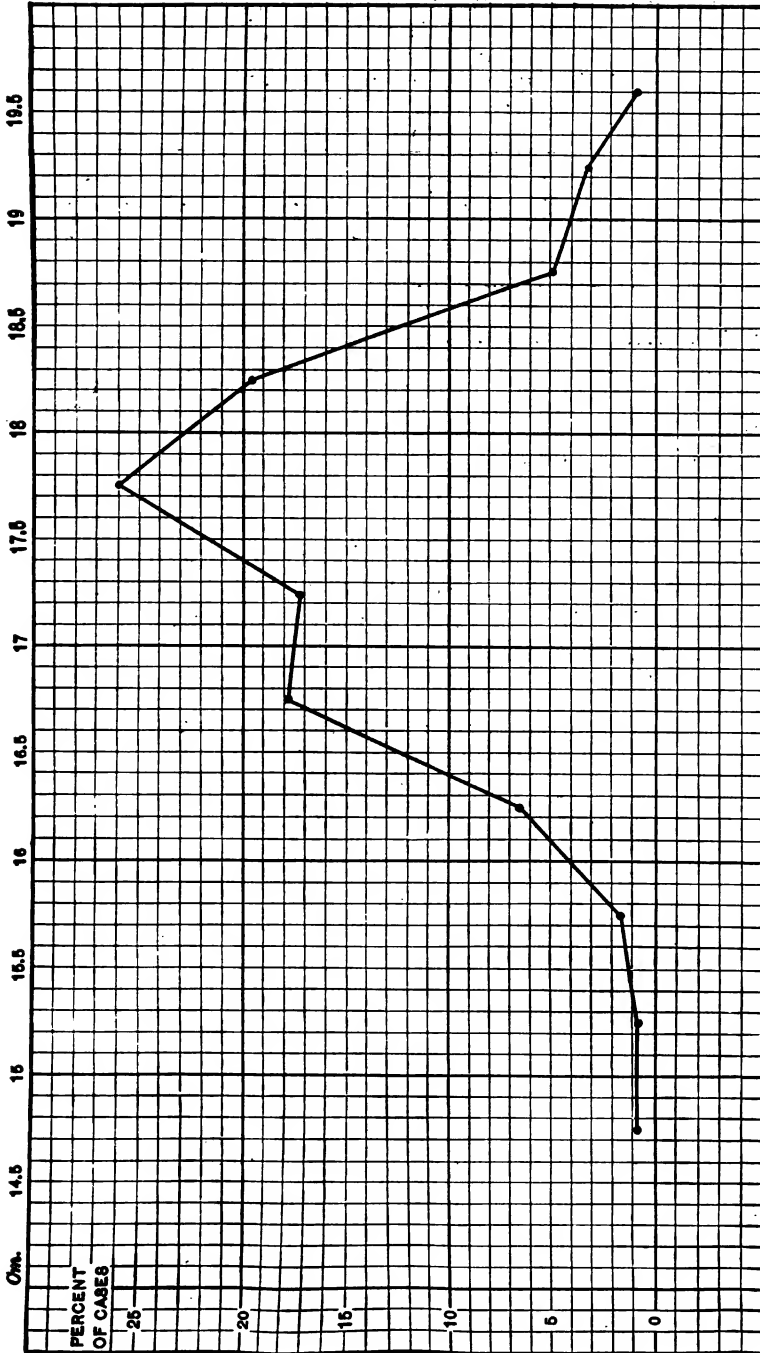


FIG. 6.—Curve showing the distribution of the physiognomic height of face (chin-hair line) among 150 adult males of the Kharga Oasis.

KHARGA OASIS, MEN: HEIGHT OF FACE, CHIN TO HAIR LINENumber of observations: 123.¹Average: 17.6 cm.²

Median: 17.6 cm. Mode: 17.8 (17.6-18) cm.

Minimum: 14.6 cm. Maximum 19.7 cm.

Table of frequencies:

	14.6-15 cm.	15.1-15.5 cm.	15.6-16 cm.	16.1-16.5 cm.	16.6-17 cm.	17.1-17.5 cm.	17.6-18 cm.	18.1-18.5 cm.	18.6-19 cm.	19.1-19.5 cm.	19.6-20 cm.
Number of cases.	1	1	2	8	22	21	32	24	6	5	1
Per cent.....	0.8	0.8	1.6	6.5	17.9	17.1	26.0	19.5	4.9	4.1	0.8

¹ In 26 individuals of the series of 150 there was more or less pronounced frontal loss of hair and in one another defect prevented the measurement.

² Probable error = 0.035; standard deviation, σ , = 0.6366, ± 0.025 ; coefficient of variability, C , = 5.634, ± 0.219 .

The Forehead

The height of the forehead from nasion to the hair line¹ averages 6.2 cm., which is noticeably less than in most groups of male whites and also other races, exclusive of the Indian and most of the Negro. The range of variation is very large, amounting to 3.5 cm., or ± 0.282 for each unit of the average; but the mass of the cases is comprised within the limits of from 5.6 to 7.0 cm. (fig. 7).

KHARGA OASIS, MEN: HEIGHT OF FOREHEAD¹Number of observations: 124.²Average: 6.2 cm.³

Median: 6.3 cm. Mode: 6.2 cm.

Minimum: 4.1 cm. Maximum: 7.6 cm.

Table of frequencies:

	4.1-4.3 cm.	4.4-4.6 cm.	4.7-4.9 cm.	5-5.2 cm.	5.3-5.5 cm.	5.6-5.8 cm.	5.9-6.1 cm.	6.2-6.4 cm.	6.5-6.7 cm.	6.8-7 cm.	7.1-7.3 cm.	7.4-7.6 cm.
Number of cases.....	1	1	2	4	4	16	20	29	24	18	2	3
Per cent.....	0.8	0.8	1.6	3.2	3.2	12.9	16.1	23.4	19.3	14.5	1.6	2.4

¹ From point corresponding to *nasion* in the skull, to the hair line.

² In 26 of the 150 individuals examined there existed more or less pronounced frontal baldness, which made the measurement of height of the forehead uncertain.

³ Probable error = ± 0.036 ; standard deviation, σ , = 0.5983, ± 0.026 ; coefficient of variability, C , = 9.650, ± 0.413 .

¹ Where the hair extended downward in a V-shaped manner in the median line, the measurement was taken to the middle of a curved line, moderately convex downward, connecting the lateral parts of the hair boundary; but such cases were rare.

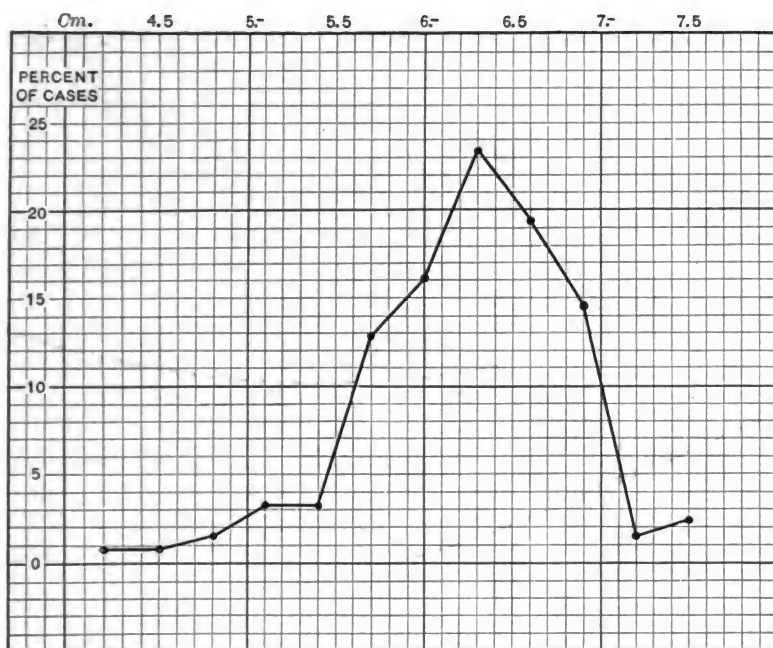


FIG. 7.—Curves showing the distribution of the height of the forehead (nasion-hair line) measurement, among 124 Kharga men free from calvitia.

Chin-Nasion Height

The distance from the lowest point of the chin in median line to a point corresponding to the middle of the fronto-nasal articulation,¹ gives the height of the facial parts proper, speaking anatomically.

Due to this fact the measurement is more suitable for the study of the relations that exist between the development of the face and that of the vault of the skull than the total or physiognomic facial height, which includes the forehead and is affected by the variation of the latter, representing to an important extent external conditions of a portion of the vault.

The dimension (as also the total facial height) increases to some extent with age; but in old people it is frequently found to be more or less reduced, due to the wear or loss of the teeth and absorption of the alveolar processes. In the Kharga series no individual presented such conditions in a marked degree and no decided effects of age on the measurement, as will be seen later on, are perceptible.

¹ The point on the skin corresponding to *nasion* on the skull can in many cases be determined accurately by feeling, in others it must be estimated on the basis of the knowledge regarding the usual situation of the point in the cranium. It is generally somewhat above the middle of the intercanthic line.

Such defects, therefore, have not influenced materially the average of the series, and this may safely be used for comparisons.

The average of the chin-nasion height in the Kharga men is 11.35 cm.; 19 Jews measured by Weisbach (l. c.) gave the mean of 12.6, 26 Roumanians 11.7, 25 northern Slavs 11.6 and 20 Magyars 11.1 cm., while a large series of Alsations and Germans gave Pfitzner (l. c.) the mean of approximately 12.5 cm. No data, regrettably, on the Valley Egyptians are available for comparison, Chantre having measured the face height from chin to ophryon and Myers that from upper alveolar point to nasion. The range of variation of the measurement in the Kharga men, though less than that of the chin-hair line facial height, is still relatively large; it extends over 43 mm., which amounts to ± 0.189 per unit of the average; but 85.4 per cent of the cases are within the limits of 10.5-12 cm. The detailed distribution of the cases shows two well separated modes, which condition in the somewhat condensed curve (fig. 8) manifests itself in a distinct shouldering, quite like that which appears in the curve of distribution of the physiognomic facial height (fig. 6).

**KHARGA OASIS, MEN: HEIGHT OF FACE, CHIN TO A POINT
CORRESPONDING TO NASION**

Number of observations: 150.

Average: 11.35 cm.¹ (1st 50: 11.5; 2d 50: 11.25; 3d 50: 11.3 cm.).

Median: 11.4 cm. Modes: 10.9 and 11.6 cm.

Minimum: 9.6 cm. Maximum: 13.9 cm.

Table of frequencies:

	9.6 cm.	9.7-9.8 cm.	9.9-10 cm.	10.1-10.2 cm.	10.3-10.4 cm.	10.5-10.6 cm.	10.7-10.8 cm.	10.9-11 cm.	11.1-11.2 cm.	11.3-11.4 cm.
Number of cases....	1	1	2	1	1	11	18	19	13	14
Per cent.....	0.7	0.7	1.3	0.7	0.7	7.3	12.0	12.7	8.7	9.3

	11.5-11.6 cm.	11.7-11.8 cm.	11.9-12 cm.	12.1-12.2 cm.	12.3-12.4 cm.	12.5-12.6 cm.	12.7-12.8 cm.	12.9-13 cm.	13.9 cm.
Number of cases.....	25	15	13	7	3	2	2	1	1
Per cent.....	16.7	10.0	8.7	4.7	2.0	1.3	1.3	0.7	0.7

¹ Probable error = ± 0.035 ; standard deviation, σ , ± 0.6366 , ± 0.025 ; coefficient of variability, C , = 5.634, ± 0.219 .

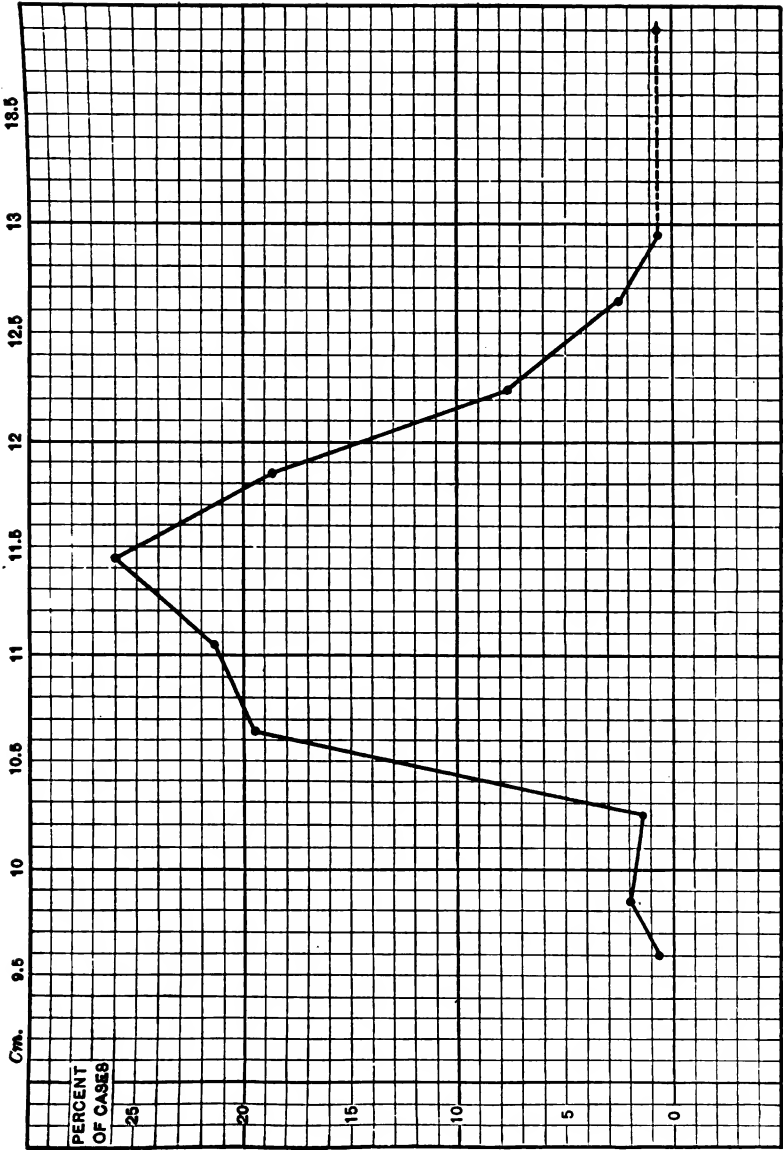


Fig. 8.—Curve showing the distribution of the anatomic height of face (chin-nasion) among 150 adult males of the Kharga Oasis.

The height of the face is believed to be to some extent directly related to the length of the head, and, as shown in the following table, the condition holds good in general for the Kharga natives; the average length of the head in the 17 men with the shortest faces is, in absolute figures, decidedly lower than that in the 16 men with the highest faces. But the height of the face and length of the head do not retain the same relations from the minimum to the maximum grades of the dimensions. The average height of the face amounts to 60.1 per cent of the average length of the head; but the average of the series of 17 shortest faces stands only in the proportion of 55.1 to 100 to the head length of the same individuals, while in the 16 men with the longest faces the proportion rises to 65.3 per cent. Or, if we express the relation in another way, the length of the head is to the height of the face in those with average height of the latter as 166.5, in those with the absolutely lowest faces as 181.5, and in those of absolutely highest faces as 153.2 to 100. The height of the face therefore does not preserve throughout the series equal proportions with the length of the head, but augments at a more rapid rate. The causes of this phenomenon, which will probably be found in all ethnic groups, offer a field for further investigation.

The height of the head averages exactly as much in the Kharga men with the lowest as in those with the highest faces, and therefore these two dimensions in this particular ethnic group influence each other, if at all, only immaterially.

The relation of face height to head form is disappointingly small; it is such that the average of the series of lowest faces corresponds to a slightly higher (by 1.2 points) average cephalic index than that of the highest faces; but in the individual cases there are many irregularities. These data, and those spoken of in the preceding paragraph, show that in the Kharga Egyptians a correlation exists in a plainly evident form only between the height of the face and the length of the head—which agrees with other observations on the subject; and that no regular correlation appears between the facial height and the head height or head breadth.

The height of the face shows apparently also, it is seen in the next table, a certain relation with the stature. The series of individuals with the lowest faces is marked by a very perceptibly lower average stature than that of the highest faces. A high stature, therefore, carries with it, in general, a higher face. It however also carries with it, as seen in previous sections, a longer or rather larger head, and it is the latter with which the facial height is,

KHARGA OASIS, MEN: RELATION OF HEIGHT OF FACE (OHIN-NASION), AND OF HEIGHT OF FOREHEAD, TO STATURE, HEAD LENGTH, HEAD FORM AND AGE

17 Shortest Faces of the Series

Height of face chin to nasion point	Height of fore- head: nasion point to hair- line	Stature	Length of the head	Height of the head	Cephalic index	Approximate age of sub- ject
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>Years</i>
9.6	5.8	163.7	18.0	12.5	77.8	38
9.8	6.0	165.2	19.2	13.0	77.1	45
9.9	6.4	156.3	18.2	13.0	76.9	40
10.0	7.2	163.0	19.0	13.4	80.0	45
10.1	5.0	157.5	17.7	13.2	73.4	25
10.4	6.9	159.7	18.4	12.7	75.0	24
10.5	6.7	152.3	18.0	13.3	79.4	50
10.5	4.1	169.4	18.5	12.6	72.4	50
10.5	6.1	158.8	18.4	12.8	76.1	21
10.5	5.6	161.9	18.0	12.9	75.7	55
10.5	?	165.9	18.5	13.4	78.4	40
10.6	6.2	166.2	19.2	13.2	72.9	28
10.6	5.9	164.7	19.6	13.3	72.4	32
10.6	6.3	167.3	19.1	13.2	70.2	50
10.6	?	167.5	19.0	13.6	78.9	45
10.6	6.2	161.5	19.0	12.7	74.2	30
10.6	6.0	167.5	18.6	13.4	75.3	55

Averages (16 individuals):

<i>10.3</i> (9.6-10.6)	<i>6.0</i> (4.1-7.2)	<i>162.8</i> (152.3- 169.4)	<i>18.7</i> (17.7- 19.6)	<i>13.1</i> (12.5- 13.6)	<i>75.7</i> (70.2- 80.0)	<i>39.6</i> (21-55)
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16 Longest Faces of the Series

Height of face chin to nasion point	Height of fore- head: nasion point to hair- line	Stature	Length of the head	Height of the head	Cephalic index	Approximate age of sub- ject
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>Years</i>
12.1	6.4	163.1	19.0	12.8	71.6	26
12.1	6.2	160.7	18.8	12.7	71.3	55
12.1	6.2	168.9	19.0	13.0	74.7	32
12.1	?	170.5	19.2	13.1	76.6	45
12.1	7.4	172.7	18.9	13.4	79.4	50
12.2	?	165.0	19.7	13.3	75.0	55
12.2	6.0	164.5	18.6	12.3	75.6	52
12.3	5.6	172.4	18.6	12.8	75.3	32
12.4	?	163.2	19.5	13.4	75.4	55
12.4	5.8	168.3	18.7	12.9	72.7	50
12.5	5.3	159.6	19.1	13.8	74.3	28
12.6	6.7	166.1	20.0	13.4	72.5	28
12.7	6.8	161.7	18.8	13.3	76.1	40
12.7	7.0	169.4	20.0	13.7	73.5	30
12.9	?	166.1	19.2	12.8	73.4	45
13.9	?	165.6	19.3	13.2	74.6	45

Averages (16 individuals):

<i>12.5</i> (12.1-13.9)	<i>6.3</i> (5.3-7.4)	<i>166.1</i> (159.6- 172.7)	<i>19.15</i> (18.6- 20.0)	<i>13.1</i> (12.3- 13.8)	<i>74.5</i> (71.3- 79.4)	<i>41.7</i> (26-55)
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in the main, directly correlated. The correlation of the dimensions of the facial parts with stature is wholly indirect, and it is scarcely suitable or useful to compare the two measurements. The lack of direct connection between the facial height and stature is illustrated by the fact that in the series under consideration the percental ratio of the average stature to the average facial height amounts in those of shortest faces to 1581, while in those with the longest faces it is only 1329.

No definite correlation appears, further, between the height of the face and that of the forehead.

Breadth of the Face

(Diameter bizygomatic maximum.)

The greatest or bizygomatic breadth of the Kharga men shows the very moderate average of 13.15 cm., and the rather small range of variation of 22 mm., or ± 0.083 per unit of the average. It is considerably less variable than the chin-nasion height of the face (± 0.189 per unit of the mean) (fig. 9).

KHARGA OASIS, MEN: BREADTH OF FACE (DIAMETER BIZYGOMATIC MAXIMUM)

Number of observations: 150.

Average: 13.15 cm.¹ (1st 50: 13.18; 2d 50: 13.16; 3d 50: 13.12 cm.)

Median 13.2 cm. Mode 13.4 cm.

Minimum 11.8 cm. Maximum 14.0 cm.

Table of frequencies:

	11.8-11.9 cm.	12-12.1 cm.	12.2-12.3 cm.	12.4-12.5 cm.	12.6-12.7 cm.	12.8-12.9 cm.	13-13.1 cm.	13.2-13.3 cm.	13.4-13.5 cm.	13.6-13.7 cm.	13.8-13.9 cm.	14 cm.
Number of cases.....	1	3	..	8	12	23	24	24	27	16	10	2
Per cent.....	0.7	2.0	..	5.3	8.0	15.3	16.0	16.0	18.0	10.7	6.7	1.3

¹ Probable error = ± 0.023 ; standard deviation, σ , = 0.425, ± 0.017 ; coefficient of variability, C , = 3.23, ± 0.13 .

In general, in common with other facial breadths, the bizygomatic diameter possesses a high degree of correlation with the breadth of the head; and the same fact is observed in the Kharga Egyptians. As seen in the next table, the average breadth of head corresponding to the narrowest faces is decidedly lower than that corresponding to those of greatest breadth.

The proportional relation of the two dimensions follows what was observed in the case of the height of the face and length of the head—the face measurement augments at a more rapid rate. The ratio

between the facial and the head breadth, taking the latter as 100, is in those of the narrowest faces 91, in the broadest 95.5.

The broader faces correspond also, on the average, to a perceptibly higher cephalic index, but, again, as in the case of the facial height, the correlation between the face dimension and the head form is in the mean far less and offers much more individual

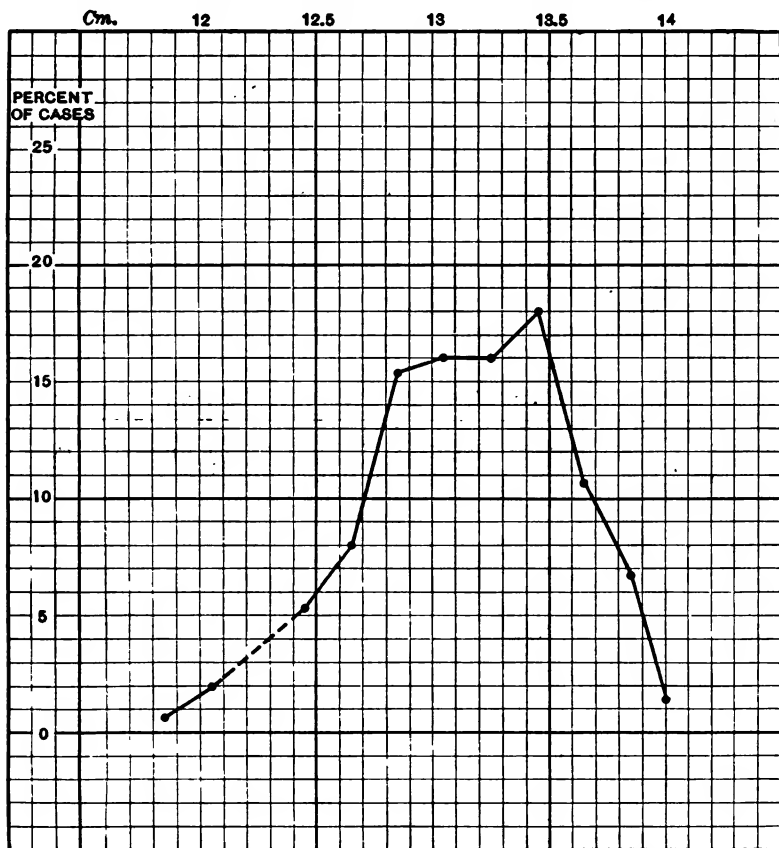


FIG. 9.—Curve showing the distribution of the diameter bizygomatic maximum in 150 adult men of the Kharga Oasis.

irregularity than that between the former and the corresponding diameter of the head. The whole can be reduced to the statement that face height stands, to a certain degree, in correlation with the head length and the face breadth with the head breadth; the correlation between the face measurements and head form are indirect and seemingly only proportionate to the liability of the corresponding head length or breadth to be accompanied with a definite head shape.

The relation between the breadth of the face and the size of the head is such, that in general larger heads will show larger and hence also absolutely broader faces than small ones. But, as the ratio of the cephalic module to the face breadth indicates, being in the narrowest faces as 121.5 and in the broadest as only 112.8 to 100, the face augments at a greater rate than the size of the head. The same condition of more rapid facial growth was shown above in relation to the separate head diameters. And as what is true in this respect of the breadth is also true of the height of the face, it may be concluded that, while in the main correlated in growth with the length and breadth of the head, yet large faces show also a degree of development independent of these factors. The causes of such growth are probably partly of hereditary and partly of acquired, especially functional nature (connected with the use and development of the muscles of mastication).

KHARGA OASIS, MEN: BREADTH OF FACE IN RELATION TO BREADTH, FORM, AND SIZE OF HEAD

22 narrowest faces (12.6 cm. and below)				18 broadest faces (13.7 cm. and above)			
Diameter bizygomatic maximum	Breadth of head	Cephalic index	Cephalic module	Diameter bizygomatic maximum	Breadth of head	Cephalic index	Cephalic module
<i>cm.</i>	<i>cm.</i>		<i>cm.</i>	<i>cm.</i>	<i>cm.</i>		<i>cm.</i>
11.8	14.0	78.6	14.80	13.7	14.2	74.7	15.68
12.0	13.2	70.7	15.02	13.7	14.1	75.8	15.00
12.1	13.0	73.4	14.63	13.7	14.9	80.1	15.77
12.1	12.8	70.3	14.43	13.7	14.6	75.6	15.80
12.4	14.1	75.8	15.18	13.7	14.8	77.1	15.80
12.5	13.4	70.9	15.08	13.7	15.0	77.3	15.77
12.5	13.9	72.8	15.27	13.8	14.2	75.1	15.45
12.5	13.6	73.1	14.95	13.8	15.2	80.0	15.87
12.5	13.6	71.6	15.22	13.8	13.4	71.3	14.98
12.5	14.2	75.5	15.20	13.8	14.2	77.6	15.32
12.5	13.6	72.0	15.18	13.8	14.4	71.6	15.85
12.5	14.2	75.5	15.33	13.8	14.4	77.4	15.27
12.6	14.8	77.1	15.67	13.8	14.8	77.1	15.78
12.6	13.8	73.0	15.25	13.9	14.1	73.4	15.37
12.6	14.0	76.1	15.07	13.9	14.4	75.0	15.77
12.6	13.8	75.0	15.22	13.9	14.3	76.1	15.52
12.6	13.4	70.2	15.23	14.0	14.6	76.4	15.67
12.6	13.5	71.8	15.23	14.0	14.4	74.6	15.62
12.6	13.1	68.2	14.95				
12.6	13.6	75.3	15.33				
12.6	14.0	76.9	15.07				
12.6	13.6	71.2	15.25				
Averages:							
12.45 (11.8- 12.6)	13.7 (12.8- 14.8)	73.4 (68.2- 78.6)	15.12 (14.43- 15.67)	13.8 (13.7- 14.0)	14.45 (13.4- 15.2)	75.9 (71.6- 80.1)	15.57 (14.98- 15.87)

Facial Form

The Physiognomic Facial Index $\left(\frac{\text{diameter bizygomatic max.} \times 100}{\text{chin—hair line height}} \right)$

The total physiognomic facial index averages in the Kharga men 74.7, showing a tendency to leptoprosopy, which will be even more clearly apparent in the anatomical index. The range of variation is not excessive, extending over 16.3 points, or ± 0.109 per point of the average. The distribution of the index presents two distinct modes (fig. 10).

KHARGA OASIS, MEN: FACIAL INDEX, PHYSIOGNOMIC

Number of individuals: 121.

Average: 74.7.

Median: 74.2. Modes: 73.3; 77.5.

Minimum 68.1. Maximum 84.4.

Table of frequencies:

	68.1-69	69.1-70	70.1-71	71.1-72	72.1-73	73.1-74	74.1-75	75.1-76	76.1-77
Number of cases.	5	5	7	6	16	20	11	10	7
Per cent.....	4.1	4.1	5.8	5.0	13.2	16.5	9.1	8.3	5.8

	77.1-78	78.1-79	79.1-80	80.1-81	81.1-82	82.1-83	83.1-84	84.1-85
Number of cases.....	14	6	7	2	1	2	1	1
Per cent.....	11.6	5.0	5.8	1.6	0.8	1.6	0.8	0.8

The Anatomical Facial Index $\left(\frac{\text{chin-nasion point height} \times 100}{\text{diameter bizygomatic maximum}} \right)$

The anatomic, or facial index proper, averages 86.3, which approaches the boundary between meso- and leptoprosopy.¹ Its range of variation is unexpectedly larger than that of the physiognomic index, extending over 30.7 points, or ± 0.178 per unit of average, but the distribution of the index shows that 93.3 per cent of the cases are concentrated between the boundaries of 78 and 94. Only two individuals occur with chamæprosopy; in 119 the face is mesoprosopic and in 29 leptoprosopic (fig. 10).

¹Chamaeprosopic, below 74.9; mesoprosopic, 75-89.9; leptoprosopic 90 and above.

KHARGA OASIS, MEN: FACIAL INDEX, ANATOMIC

Number of observations: 150.

Average: 86.3.¹ (1st 50: 87.2; 2d 50: 85.5; 3d 50: 86.1.)

Median: 86.5. Mode: 87 (86-87.9).

Minimum: 72.5. Maximum: 103.2.

Table of frequencies:

	Below 74.9	75-77.9	78-79.9	80-81.9	82-83.9	84-85.9	86-87.9
Number of cases	2	2	11	9	24	23	26
Per cent.....	1.3	1.3	7.3	6.0	16.0	15.3	17.3

	88-89.9	90-91.9	92-93.9	94-95.9	96-97.9	98-99.9	100 and above
Number of cases	24	12	11	2	2	1	1
Per cent.....	16.8	8.0	7.3	1.3	1.3	0.7	0.7

¹ Probable error = 0.260; standard deviation, σ , = 4.724, ± 0.184 ; coefficient of variability, C , = 5.48, ± 0.213 .

The relation of the facial form with the head form is shown in the next table. The average lowest facial indices, in other words the least oblong faces, correspond to a somewhat higher cephalic index, that is to somewhat more rounded heads, than the average of the highest indices or most oblong faces; and the same result appears when the lowest and highest cephalic indices are taken as the base of the comparison. The correspondence of the facial and head form is seen to be quite limited, which is rather surprising, for it was shown before that there exists a considerable direct correlation between, on one side, the facial height and the head length, and on the other between the facial and head breadth. And the weakness of reciprocal relations between the two indices is made still more evident by the many individual exceptions to their correspondence. A partial explanation at least of these facts appears to be possible by the assumption, justifiable by the conditions shown by the individual measurements, that the face dimensions vary to some extent independently of those of the head, and that this form of variation disturbs or obscures more or less the otherwise well established correlation of the parts.

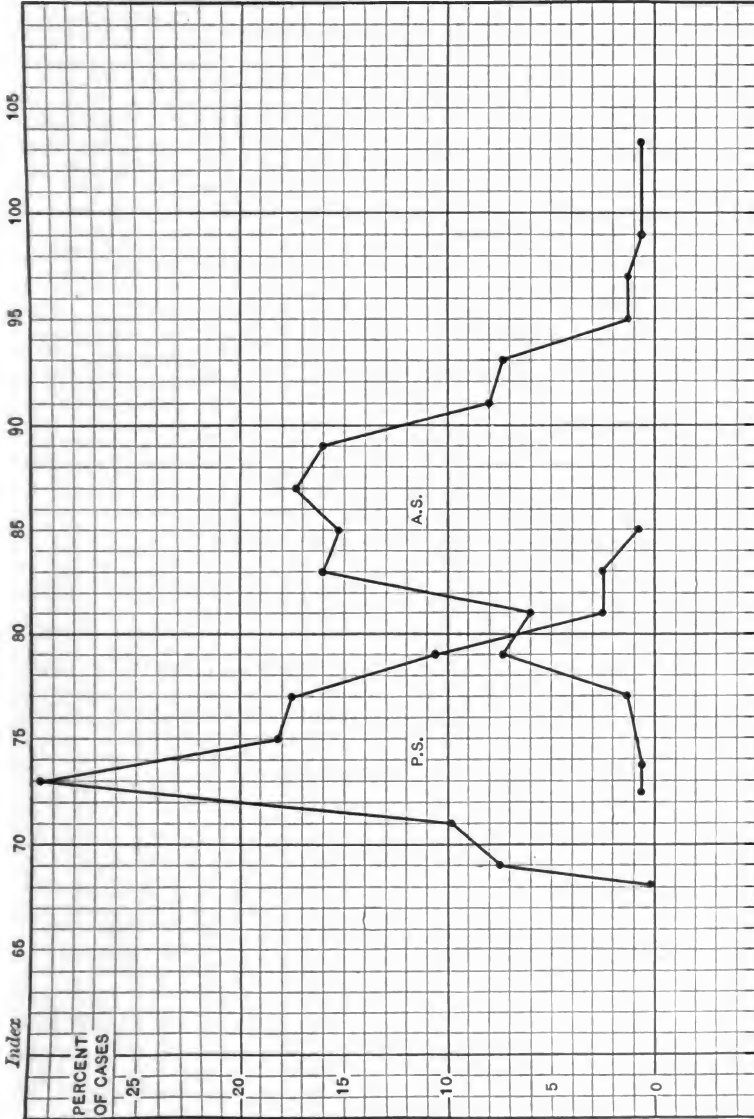


FIG. 10.—Curves showing the distribution of the physiognomic (*P. I.*) and anatomic (*A. I.*) facial indices, the former in 121, the latter in 150 adult men of the Kharga Oasis.
(The subdivisions in the two series are equidistant.)

**KHARGA OASIS, MEN: RELATION OF FACIAL (ANATOMIC) WITH
CEPHALIC INDEX**

Head Forms Corresponding to Most Oblong and to Least Oblong Faces

19 lowest facial indices: 81.0 and below		20 highest facial indices: 91.0 and above	
Facial index	Corresponding cephalic index	Facial index	Corresponding cephalic index
72.5	80.0	91.3	68.2
73.8	77.8	91.5	77.4
77.1	76.4	91.6	75.1
77.8	77.1	92.1	73.3
78.3	71.6	92.4	78.6
78.4	75.8	92.4	75.0
78.6	76.9	92.8	73.4
79.1	72.9	92.8	73.1
79.1	78.9	92.8	75.5
79.3	75.8	92.9	73.0
79.4	75.0	93.1	71.6
79.5	72.4	93.2	75.3
79.5	78.4	93.4	73.5
79.6	77.1	93.6	70.9
79.8	75.7	94.0	72.5
80.1	73.2	94.8	76.1
80.3	75.3	96.1	72.7
80.8	75.7	96.9	75.4
80.9	72.4	99.3	74.6
		103.2	74.3

Averages:

78.6 (72.5-80.9)	75.7 (71.6-80.0)	94.0 (91.3-103.2)	74.0 (68.2-78.6)
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Facial Forms Corresponding to Most Oblong and Least Oblong Heads

22 lowest cephalic indices; below 72.0		19 highest cephalic indices: 78.0 and above	
Cephalic index	Corresponding facial index	Cephalic index	Corresponding facial index
68.2	91.3	78.1	88.4
69.1	83.6	78.4	79.5
69.6	88.5	78.5	90.9
70.2	84.1	78.6	92.4
70.3	88.4	78.8	90.8
70.7	90.0	78.9	83.0
70.7	89.5	78.9	79.1
70.9	86.8	79.1	90.7
70.9	93.6	79.4	82.0
71.2	88.1	79.4	89.0
71.3	81.1	79.5	88.4
71.3	87.7	79.5	86.5
71.4	86.6	79.7	85.8
71.6	93.1	79.8	84.4
71.6	84.8	79.8	89.5
71.6	84.6	80.0	72.5
71.6	78.3	80.1	84.7
71.6	87.2	80.7	87.8
71.6	89.5	80.9	84.5
71.7	83.6		
71.8	86.8		
71.8	84.9		

Averages:

70.9 (68.2-71.8)	86.9 (78.3-93.1)	79.4 (78.1-80.9)	85.8 (72.5-92.4)
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THE NOSE

Nasal Height

The dimensions of the nose are among the most useful and most frequently practiced anthropometrical determinations, and as there is but one system of landmarks for the measurements, the data available for comparison are much more numerous than those concerning other facial proportions. Unfortunately the existing series of nose measurements are not of uniform value, for the reason that, to those who are not well trained in anatomy, the determination of the nasion

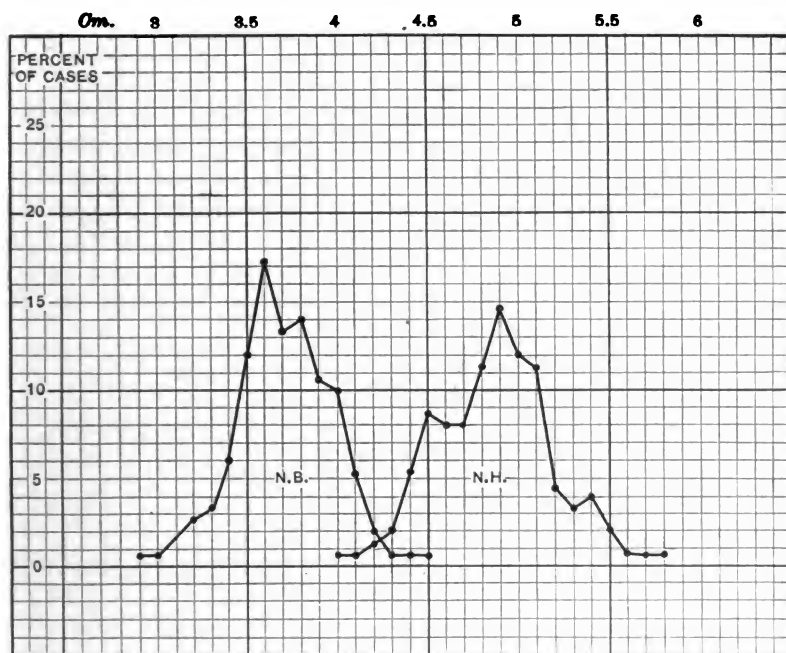


FIG. 11.—Curves showing the distribution of the nasal height (*N. H.*) and nasal breadth (*N. B.*) measurements among 150 adult men of the Kharga Oasis.

point is often a stumbling block; and also because the pronounced effect of age on the nose dimensions, which have received as yet but scanty attention. A habitual estimation of the nasion too high or too low, which is doubtless frequent in those who do not carry a clear mental view of the osseous parts of the face, is capable of resulting in important modifications of the results; and any series in which nose measurements of persons of old age are included must be regarded as altered from its normal standard in proportion to the number of the aged it embraces. The age differences in this respect

are such that a series of measurements in any people on the adults in the prime of life and on those above 60 years of age will invariably stand well apart. The nose grows with the face far into the adult life, but with the advance of senility becomes often independently broader; finally in those of old age its height tends rather towards diminution. The nasal index in the aged is thus heightened and the change is at times such that what formerly was a leptorhinc nose becomes mesorhinc, while one originally mesorhinc may become platyrhinc.

In the Kharga men, among whom but few were older than 55 years of age, the age element, though not completely eliminated, is relatively unimportant and the series may be considered in its entirety.

The average height of the nose was found to be only moderate, amounting to 4.87 cm., and it was much the same in each group of 50; it is also practically the same with the mode and the median. The range of variation of the measurement is ordinary, extending over 18 mm., or ± 0.18 per unit of the average. Eighty-four per cent of the cases are contained within the limits of 4.4 to 5.25 cm. The range of distribution of the measurement is fairly regular (fig. 11).

KHARGA OASIS, MEN: HEIGHT OF THE NOSE

Number of individuals measured: 150.

Average: 4.87 cm.¹ (1st 50: 4.91; 2d 50: 4.82; 3d 50: 4.87 cm.)

Median: 4.9 cm. Mode: 4.9 cm.

Minimum: 4.0 cm. Maximum: 5.8 cm.

Table of frequencies:

	4.0-4.05 cm.	4.1-4.15 cm.	4.2-4.25 cm.	4.3-4.35 cm.	4.4-4.45 cm.	4.5-4.55 cm.	4.6-4.65 cm.	4.7-4.75 cm.	4.8-4.85 cm.	4.9-4.95 cm.
Number of cases....	1	1	2	3	8	13	12	12	17	22
Per cent.....	0.7	0.7	1.3	2.0	5.3	8.7	8.0	8.0	11.3	14.7

	5.0-5.05 cm.	5.1-5.15 cm.	5.2-5.25 cm.	5.3-5.35 cm.	5.4-5.45 cm.	5.5-5.55 cm.	5.6-5.65 cm.	5.7-5.75 cm.	5.8 cm.
Number of cases.....	18	17	7	5	6	3	1	1	1
Per cent.....	12.0	11.3	4.7	3.3	4.0	2.0	0.7	0.7	0.7

¹ Probable error = ± 0.018 ; standard deviation, σ , = 0.330, ± 0.013 ; coefficient of variability, C , = 6.78, ± 0.264 .

A comparison with the other facial measurements shows that, as in other ethnic groups, so in the Kharga Egyptians the nasal height bears a close correlation with the height of the face. This condition is brought out very plainly in the following table. The nasal height does not, however, rise exactly proportionately with the facial height, but shows a slight retardation; this indicates an increase, with advancing height of face, not only in the absolute, but also in the relative height of the subnasal region.

KHARGA OASIS, MEN: RELATION OF THE FACIAL AND NASAL HEIGHT IN THOSE OF THE SHORTEST AND THOSE OF THE LONGEST FACES

17 shortest faces of the series		16 longest faces of the series	
Height of face, chin-nasion point	Height of nose	Height of face chin-nasion point	Height of nose
<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	<i>cm.</i>
9.6	4.5	12.1	5.0
9.8	4.2	12.1	4.8
9.9	4.4	12.1	5.5
10.0	4.6	12.1	5.1
10.1	4.6	12.1	5.3
10.4	4.0	12.2	5.0
10.5	4.5	12.2	5.2
10.5	4.5	12.3	5.2
10.5	4.5	12.4	5.8
10.5	4.7	12.4	5.05
10.5	4.6	12.5	4.7
10.6	4.4	12.6	4.7
10.6	4.5	12.7	5.5
10.6	4.5	12.7	5.3
10.6	4.7	12.9	5.0
10.6	4.4	13.9	5.7
10.6	4.6		
10.3	4.5 (4.0-4.7)	12.5	5.2 (4.7-5.8)

(Nose height—face height index 43.7) (Nose height—face height index 41.6)

Nasal Breadth

The breadth of the nose averages in the Kharga men 3.73 cm., and the range of variation is larger than that of the nasal height, extending over 16 mm., or ± 0.216 per unit of the average. Eighty-nine per cent of the cases fall between 3.4 and 4.15 cm.

KHARGA OASIS MEN: BREADTH OF THE NOSE

Number of individuals measured: 150.

Average: 3.73 cm.¹ (1st 50: 3.8; 2d 50: 3.7; 3d 50: 3.7 cm.)

Median: 3.7 cm. Mode: 3.6 cm.

Minimum: 2.9 cm. Maximum: 4.5 cm.

Table of frequencies:

	2.9-2.95 cm.	3.0-3.05 cm.	3.1-3.15 cm.	3.2-3.25 cm.	3.3-3.35 cm.	3.4-3.45 cm.	3.5-3.55 cm.	3.6-3.65 cm.	3.7-3.75 cm.
Number of cases.	1	1	..	4	5	9	18	26	20
Per cent	0.7	0.7	..	2.7	3.3	6.0	12.0	17.3	13.3

	3.8-3.85 cm.	3.9-3.95 cm.	4.0-4.05 cm.	4.1-4.15 cm.	4.2-4.25 cm.	4.3-4.35 cm.	4.4-4.45 cm.	4.5 cm.
Number of cases.....	21	16	15	8	3	1	1	1
Per cent.....	14.0	10.7	10.0	5.3	2.0	0.7	0.7	0.7

¹ Probable error = ± 0.014 ; standard deviation, σ , = 0.263, ± 0.0107 ; coefficient of variability, C , = 7.06, ± 0.27 .

KHARGA OASIS, MEN: RELATION OF THE FACIAL AND NASAL BREADTH IN THOSE OF THE SHORTEST AND THOSE OF THE LONGEST FACES

22 narrowest faces		18 broadest faces	
Diameter bizygomatic maximum	Breadth of nose	Diameter bizygomatic maximum	Breadth of nose
11.8	3.25	13.7	3.8
12.0	3.9	13.7	3.7
12.1	3.75	13.7	3.65
12.1	3.35	13.7	3.7
12.4	3.6	13.7	3.95
12.5	3.65	13.7	3.7
12.5	3.8	13.8	3.8
12.5	3.5	13.8	3.9
12.5	3.7	13.8	3.5
12.5	3.3	13.8	4.15
12.5	3.6	13.8	3.9
12.5	3.6	13.8	3.65
12.6	3.9	13.8	3.6
12.6	3.65	13.9	3.65
12.6	3.6	13.9	3.8
12.6	3.65	13.9	3.65
12.6	3.9	14.0	3.8
12.6	3.65	14.0	3.5
12.6	3.3		
12.6	3.8		
12.6	3.5		
12.6	3.8		
12.45	3.62 (3.25-3.9)	13.8	3.75 (3.5-4.15)

(Nose breadth—face breadth index:
29.1)(Nose breadth—face breadth index:
27.1)

As the height of the nose stands in correlation with the height of the face, so the breadth of the organ is correlated with facial breadth. The correspondence of the two dimensions in the Kharga natives is, however, not quite so close as in the case of the height, and individual exceptions are much more frequent, due to the variability and to some extent independent development of the zygomatic arches, which are included in the face measurement. The dimensions of the arches are influenced, it is well known, by the development of the temporal muscles.

$$\text{Nasal Index} = \left(\frac{\text{breadth of nose} \times 100}{\text{height of nose}} \right).$$

The average nasal index of the Kharga men, 76.6, is typically mesorhinian. It corresponds closely, as will be shown below, to that of the Valley Egyptians, the Bedjah Nubians and also some of the Berbers and other non-negroid African peoples. It is moderately higher than that of the pure Arabs and that of the whites, but is decidedly lower than that of the Soudan and other negroes.

KHARGA OASIS, MEN: NASAL INDEX

Number of observations: 150.

Average: 76.59.¹ (1st 50: 77; 2d 50: 76.8; 3d 50: 75.8).

Median 76.3. Mode: 73.5 (72.6-75).

Minimum: 56.7. Maximum: 95.12.

Table of frequencies:

	56.73-57.5	57.6-60	60.1-62.5	62.6-65	65.5-67.5	67.6-70	70.1-72.5	72.6-75	75.01-77.5
Number of cases.	1	1	4	1	6	9	19	23	21
Per cent	0.7	0.7	2.7	0.7	4.0	6.0	12.7	15.3	14.0

	77.6-80	80.1-82.5	82.6-85	85.1-87.5	87.6-90	90.1-92.5	92.6-95	95.1
Number of cases	21	14	6	12	5	3	3	1
Per cent	14.0	9.3	4.0	8.0	3.3	2.0	2.0	0.7

¹ Probable error ± 0.403 ; standard deviation, σ , = 7.320, ± 0.285 ; coefficient of variability, C , = 9.51, ± 0.371 .

As to comparative data, we have especially the measurements of Chantre and Myers on the Egyptians and Nubians, and those of Collignon on the Tunisians and various other more western North Africans. Chantre's records are, regrettably, of only limited use, as his measurements of the height of the nose, due to some peculiarity of his method, are too low and his nasal indices result correspondingly high. Nevertheless they show a fairly close relation of the nasal index in the several Egyptian and Nubian (Bedjah) groups that were examined. Myers' observations, though applying to a more heterogeneous material than that of Kharga and one composed of only young men, give results that show a close accordance with those from the Oasis. The mean nasal index of 349 Mahomedan soldiers is 75.83 and that of 42 Copts 75.8. The index augments from north to south, ranging from 73.4 in the district of Dakahlia to 78.1 at Assiut (in the same latitude as Kharga) and to 78.9 in that of Kena. An abstract of Collignon data and those he quotes, are as follows:

NASAL INDEX IN THE LIVING NON-NEGROID PEOPLES OF NORTH AFRICA

(After Collignon¹)

23	Tunisian Arabs (Collignon)	65.2
184	Kabyls (Prengruber)	66.5
120	Tunisians, Berber race II, (Col.)	69.8
33	Algerians, divers (Col.)	69.9
1334	Tunisians (Col.)	70.2
40	Tunisians, Berber race IV of Ellez (Col.)	72.0
50	Tunisians brachycephalic Berber race, I (Col.)	72.5
6	Moroccans (Col.)	74.3
—	Berbers of Touggourt (Rouaras. Weissgerber)	75.0
113	Tunisians, Berber race III, of Djerid (Col.)	76.6

In whites (French, Mediterranean, Finns, Galtchas), as quoted by Collignon, the mean nasal index ranges from 63 to 69.4, in Negroes, African and Oceanic, from 87.9 to 108.9. These data are not very extended, but suffice to show the position in respect to the nasal index of the Kharga Egyptians.

The range of variation of the nasal index in the Kharga men is large, reaching 38.4 points, which amounts to 0.25 for each unit of the average.

¹ Collignon, R.: La nomenclature quinaire de l'indice nasal du vivant, *Rév. d'anthropol*, 3^{me} sér., II, 1887, pp. 8-20.

The distribution of the nasal index of the Kharga men is somewhat peculiar. The apex of the curve illustrating the same precedes unusually both the average and the median; following the apex the curve is shouldered, and finally it shows a smaller secondary grouping between 85.1 and 87.5. It seems as if there were a tendency toward a double mode (at about 73.5 and 78) or even a triple mode (+ 86). These features might be disregarded were it not for the fact that Myers, on the Valley Egyptians, obtained "in all the provinces which we chance to have examined frequency polygons showing one peak at 72 or 78."¹ By mathematical considerations Myers² is "forced to the conclusion that the coincident position of the peaks, in the various provinces which we have been considering, is a matter of pure accident, and that it is in no sense a proof of the presence of two or more distinct ethnic types, variously distributed in the different provinces of the country."³ But to the present writer the accidental nature of the peculiarities of the distribution of the nasal index, both in the Valley and at the Oasis, is not so clearly demonstrated. However the case may be, the following facts are well established and should be borne in mind in this connection: The Egyptian, in the Valley or the Oasis, is fundamentally distinct by descent and in physical characteristics from the Nubian or Soudan negro; but he is now everywhere more or less mixed with the negro, and his nose, as well as hair, color, lips, and doubtless other features, have suffered accordingly; the nose of the Egyptian, as known from the crania, mummies, and the present more pure-blooded population, is mesorhinic, while that of the negro is platyrhinic, and an admixture of the negro would tend to augment the mesorhiny and cause the appearance, or make more frequent the appearance, of platyrhiny—as well shown by Myers on his "mixed" group and also in comparisons of the Copts and Mahommedans;³ and the here enumerated effects can not but have influenced the averages of the nasal measurements and index, as well as their range and curves of distribution, in the present day Egyptian. Whether they are responsible for the double apex of the nasal index polygons in the Valley and for the peculiarities of that of the Oasis men can be better determined when we have more knowledge concerning the process of racial mixture and its effects, but the conditions of the case are such that consequences of that nature may be regarded as at least possible (fig. 12).

¹ L. c., Journ. Anthr. Inst., Vol. 36, 1906, p. 246.

² Ibid., p. 255.

³ Ibid., p. 263 et seq.

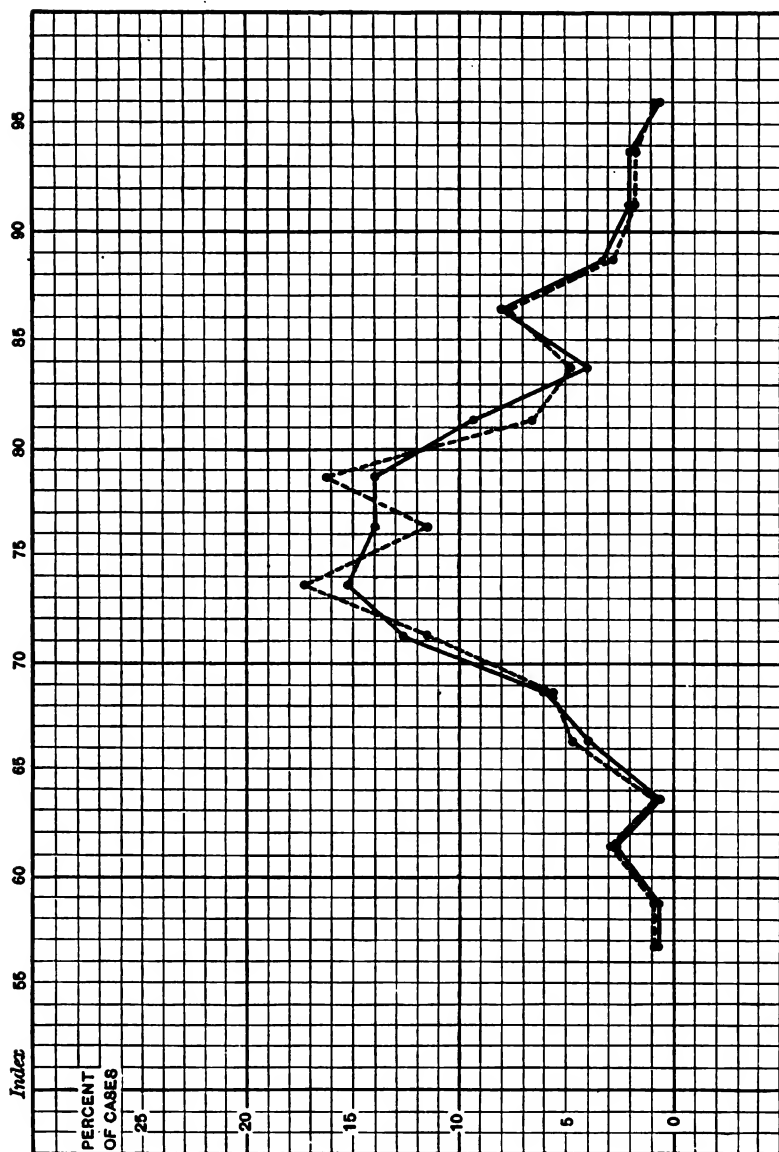


FIG. 12.—Curves showing the distribution of the nasal index in 150 adult men of the Kharga Oasis (solid line) and of same age after elimination of men less than 27 or more than 54 years of age (104 individuals; broken line).

An inquiry as to the respective values of the two nasal measurements shows, as will be seen in the next table, in the thirteen cases with the lowest indices (av. 65.), that the height exceeds the average nasal height of the entire series in the proportion of 108 to 100, while the breadth stands to the general average nasal breadth in the Kharga men as 90 to 100; it is evident, therefore, that in leptorhiny, at Kharga, the nose is both higher and narrower, differing in both dimensions nearly alike from the general average. And an inquiry into the twelve cases with the highest nasal indices shows similar conditions, in a reversed way—the nose is both lower and broader and that by nearly the same proportion (height = 91.8, breadth = 109.1 per cent) as the general averages of these dimensions.

KHARGA OASIS, MEN: DIMENSIONS OF THE NOSE IN CASES OF LOWEST AND THOSE OF HIGHEST NASAL INDEX

13 lowest nasal indices			12 highest nasal indices		
Index	Height of nose	Breadth of nose	Index	Height of nose	Breadth of nose
56.73	5.2	2.95	88.04	4.6	4.05
60.00	5.0	3.0	88.24	5.1	4.5
61.40	5.7	3.5	88.37	4.3	3.8
61.82	5.5	3.4	88.89	4.5	4.0
62.26	5.3	3.3	89.78	4.4	3.95
62.50	5.2	3.25	90.70	4.3	3.9
64.00	5.0	3.2	91.11	4.5	4.1
65.45	5.5	3.6	92.31	4.55	4.2
66.04	5.3	3.5	93.33	4.2	3.9
66.35	5.2	3.45	92.86	4.5	4.2
66.67	5.4	3.6	94.56	4.6	4.35
66.67	5.4	3.6	95.12	4.1	3.9
67.35	4.9	3.3			
Averages:					
63.63	5.28	3.36	91.03	4.47	4.07
Ratio of mean:					
....	108.3	90.0	....	91.8	109.1

The relations of the two nose measurements and of the nasal index to age, can not be discussed to best advantage with a series from which all senile subjects were excluded; nevertheless certain facts of interest are apparent. The following table gives the nasal dimensions and index in 21 youngest and 25 oldest men of the series. It is

seen that both the nasal dimensions as well as the nasal index are higher in the old than in the young, though there are individual exceptions. The breadth has augmented more than the length, hence the higher index.

**KHARGA OASIS, MEN: NASAL MEASUREMENTS AND
INDEX IN RELATION TO AGE**

21 youngest individuals examined: 21 to 26 years of age				25 oldest individuals examined: 55 to 65 years of age			
Approximate age of subject	Length of nose	Breadth of nose	Nasal index	Approximate age of subject	Length of nose	Breadth of nose	Nasal index
21	4.5	3.6	80.00	55	5.0	3.7	74.00
22	4.9	3.8	77.55	55	5.8	4.2	72.41
23	4.9	3.55	72.45	55	5.15	4.15	81.37
23	4.7	3.25	69.15	55	5.1	3.7	72.55
24	5.0	3.6	72.00	55	5.0	4.1	82.00
24	4.6	3.7	80.43	55	4.6	4.35	94.57
24	4.8	3.3	68.75	55	4.55	4.2	92.31
24	4.0	3.5	87.50	55	4.8	3.5	72.92
24	4.7	3.7	78.72	55	4.7	4.1	87.23
24	5.1	3.6	70.59	55	5.1	4.4	86.27
24	4.8	3.55	73.96	55	5.6	4.0	71.43
24	4.9	3.7	75.51	55	5.5	3.4	61.82
25	4.6	3.75	81.52	55	4.4	3.8	86.36
25	4.6	3.65	79.34	55	4.6	3.65	79.35
25	4.8	3.7	77.08	55	4.6	3.5	76.09
25	4.9	3.8	77.55	55	5.1	3.7	72.55
26	5.0	3.6	72.00	55	4.9	3.95	80.61
26	4.8	3.7	77.08	55	5.0	3.8	76.00
26	4.4	3.35	76.13	55	4.6	4.05	88.04
26	5.1	3.45	67.65	58	5.4	4.0	74.07
26	4.8	3.9	81.25	60	5.1	4.5	88.24
				60	4.8	3.9	81.25
				60	5.0	4.15	83.00
				60	4.8	3.65	76.04
				65	5.0	3.4	68.00
Averages:							
24.3	4.76 (4.0-5.1)	3.6 (3.25-3.9)	75.8 (67.6-87.5)	56.4	4.97 (4.4-5.8)	3.9 (3.4-4.5)	78.8 (61.8-94.6)

The above comparison can be made still more complete by the inclusion of the measurements and index that correspond to the adults of mean age, or say those from 35 to 45. The data are then as follows:

	Mean age	Mean nasal length	Percental relation to general average length	Mean nasal breadth	Percental relation to general average breadth	Mean nasal index
The entire series of 150..	40.0	4.87	100	3.73	100	76.6
21 youngest adults	24.3	4.76	97.7	3.6	96.5	75.8
42 adults between 35 and 45 years of age..	40.0	4.85	99.2	3.72	99.7	76.7
25 oldest adults	56.4	4.97	102.1	3.9	104.6	78.8

These figures show that the average nasal measurements and index in the adults in the "best" years agree very closely with the general averages of the entire series; and that both the measurements and the index are smaller in the youngest and larger in the oldest adults than in those of mean age or in the Kharga series as a whole. These conditions, notwithstanding individual exceptions and variations, are so regular and well marked that they can not be regarded as accidental. They bear evidence to the fact that in general the nose grows both in length and breadth even after a fully adult life is reached, apparently even after 45 years of age; they show that the growth is perceptibly greater in the breadth than in the length; and as a result of these alterations the mean nasal index increases with age, advancing towards platyrrhiny. Judging from the writer's experiences with the Indian, the augmentation in length ceases somewhere before the age limit of the present series, and later on the dimension may diminish; but the breadth seems to increase slightly or retain its maximum proportions—unless affected by emaciation or pathological conditions, to the end of the life. A series of the oldest individuals in the Kharga Oasis would, it can be confidently expected, show a nasal index of still higher value than that shown by the group of the oldest men that were measured.

The differences in the mean nasal index in the youngest and that in the oldest men in the present series, suggested that the age factor might be responsible for what irregularities there were observed in the distribution of the index. But eliminating the "youngest" and "oldest" groups had actually the opposite effect, accentuating the main mode at 72.6-75, as well as the tendency towards a second mode at 77.6-80 and not influencing appreciably the third grouping at 85.1-87.5. And the large variability of the series is not diminished. In this manner the curve of distribution of the index approaches that obtained by Myers in the Valley and the probability grows that the irregularity is due to admixture, which otherwise passed undetected at Kharga, of the platyrrhine Soudanese.

**KHARGA OASIS, MEN: NASAL INDEX IN ADULTS BETWEEN 27
AND 54 YEARS OF AGE**

	56.73-57.5	57.6-60	60.1-62.5	62.6-65	65.1-67.5	67.6-70	70.1-72.5	72.6-75	75.1-77.5
Men 27-54 years of age (104 cases).....	1	1	3	1	5	6	12	18	12
Per cent.....	1.0	1.0	2.9	1.0	4.8	5.8	11.5	17.3	11.5
Whole series (150).....	1	1	4	1	6	9	19	23	21
Per cent.....	0.7	0.7	2.7	0.7	4.0	6.0	12.7	15.3	14.0

	77.6-80	80.1-82.5	82.6-85	85.1-87.5	87.6-90	90.1-92.5	92.6-95	95.12
Men 27-54 years of age (104 cases).....	17	7	5	8	3	2	2	1
Per cent.....	16.3	6.7	4.8	7.7	2.9	1.9	1.9	1.0
Whole series (150).....	21	14	6	12	5	3	3	1
Per cent.....	14.0	9.3	4.0	8.0	3.3	2.0	2.0	0.7

It remains to inquire into the relations of the nasal index to that of the face, and to the cephalic index. In detail these relations appear as shown below.

The first important point observed is that low or high nasal indices are in adults, before senility becomes established, not due as a rule to excess or defect in one of the measurements from which the index is determined, but to concurrent and to a large extent correlative excess in one and defect in the other. Low nasal index, as has already been shown in other connections, goes with a greater than average height and a subaverage breadth of the organ, while high index is conditioned by a less than average height and greater than average breadth of the nose. And in both categories of cases, that is, in low as well as high nasal indices, the differences in the measurements from the general mean of the same dimensions are quite alike for the length and the breadth. Thus in the group of the lowest nasal indices the height of the nose stands to the general average of the measurement in the Kharga series (4.87 cm.) in round figures as 107 to 100, or +7, and the breadth as 92 to 100, or -8; while in the group of the highest indices, similar proportions are respectively 92, or -8, and 108, or +8, to 100.

**KHARGA OASIS, MEW: RELATION OF THE NASAL INDEX TO NASAL HEIGHT
AND BREADTH, TO FACIAL HEIGHT, BREADTH AND INDEX,
AND TO CEPHALIC INDEX**

20 Lowest Nasal Indices; below 68.0

Nasal index	Nasal height	Nasal breadth	Height of the face	Breadth of the face	Facial index	Cephalic index
56.7	5.2	2.95	12.3	13.2	93.2	75.3
60.0	5.0	3.0	11.9	13.2	90.1	73.8
61.4	5.7	3.5	13.9	14.0	99.3	74.6
61.8	5.5	3.4	11.5	13.3	86.5	79.5
62.3	5.3	3.3	10.9	12.5	87.2	75.5
62.5	5.2	3.25	11.5	13.1	87.8	75.8
64.0	5.0	3.2	11.8	13.0	90.8	75.4
65.5	5.5	3.6	12.7	13.4	94.8	76.1
66.0	5.3	3.5	11.5	13.2	87.1	77.9
66.3	5.2	3.45	11.7	12.7	92.1	73.3
66.7	5.4	3.6	12.0	13.4	89.5	79.8
66.7	5.4	3.6	11.9	13.4	88.8	76.1
63.7	4.9	3.3	11.5	12.6	91.3	68.2
67.6	5.1	3.45	11.2	12.9	86.8	71.8
68.0	5.0	3.4	11.8	12.9	91.5	77.4
68.0	5.0	3.4	11.2	13.2	84.8	71.6
68.3	5.2	3.55	11.4	13.0	87.7	74.2
68.7	4.8	3.3	11.0	13.0	84.6	73.5
69.1	4.7	3.25	10.9	11.8	92.4	78.6
69.1	5.5	3.8	12.1	13.5	89.6	74.7

Averages:

65.4 (56.7- 69.1)	5.2 (4.7- 5.8)	3.4 (2.95- 3.8)	11.7 (10.9- 13.9)	13.1 (11.8- 14.0)	89.8 (84.6- 99.3)	75.2 (68.2- 79.8)
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21 Highest Nasal Indices, 84.0 and above

Nasal index	Nasal height	Nasal breadth	Height of the face	Breadth of the face	Facial index	Cephalic index
86.4	4.4	3.8	10.8	12.7	85.0	77.5
86.4	4.4	3.8	12.0	13.4	89.5	71.6
86.3	5.1	4.4	12.0	13.2	90.9	78.5
86.7	4.5	3.9	10.6	12.6	84.9	75.0
86.9	4.2	3.65	10.7	12.6	84.1	70.2
87.0	4.6	4.0	10.9	13.3	81.9	74.7
87.0	4.6	4.0	11.0	13.1	84.0	72.7
87.2	4.7	4.1	10.9	13.6	80.1	73.2
87.5	4.0	3.5	10.4	13.1	79.4	75.0
88.0	4.6	4.05	10.6	13.2	80.3	75.3
88.2	5.1	4.5	12.0	13.1	77.1	70.4
88.4	4.3	3.8	10.8	14.0	91.6	75.1
88.9	4.5	4.0	10.5	12.8	82.0	79.4
89.8	4.4	3.95	10.6	12.9	82.2	74.2
90.7	4.3	3.9	11.2	13.3	84.2	77.6
91.1	4.5	4.1	11.1	13.3	83.5	72.4
92.3	4.55	4.2	11.5	12.9	89.1	73.0
92.9	4.2	3.9	9.8	12.6	77.8	77.1
93.3	4.5	4.2	10.5	13.2	79.5	72.4
94.6	4.6	4.35	10.7	13.2	81.1	71.3
95.1	4.1	3.9	10.8	12.0	90.0	70.7

Averages:

88.9 (86.4- 95.1)	4.5 (4.0- 5.1)	4.0 (3.5- 4.5)	10.9 (10.4- 12.0)	13.1 (12.6- 14.0)	83.7 (77.1- 91.6)	74.4 (70.2- 79.4)
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The influence of the facial height on the nose is again seen to be pronounced. It affects primarily the nasal height, secondarily the nasal index. The higher the face, the higher, as a rule, the nose and the lower the nasal index; and vice versa.

The breadth of the face, notwithstanding the correlation with it of the nasal breadth, evidently influences the facial index only secondarily and very irregularly. This is unexpected, but so far as this particular ethnic group is concerned, the lack of correspondence, at least for the cases with the lowest and the highest nasal indices, is very plain.

As to the relation of the nasal with the cephalic index in the Kharga men, the results are negative. It is seen in the two groups representing the extremes of the nasal index that not only the mean corresponding cephalic index but even the range of variation are quite alike.

SECONDARY FACIAL MEASUREMENTS

Diameter Frontal Minimum

The smallest frontal breadth, determined in 100 of the Kharga men, averages 10.26 cm., and varies to the moderate extent of 18 mm. or ± 0.087 per unit of the average. The distribution of the measurement is fairly regular. Its anthropological value is not great.

KHARGA OASIS, MEN: DIAMETER FRONTAL MINIMUM

Number of individuals measured: 100.

Average: 10.26 cm. (1st 50: 10.3; 2d 50: 10.2 cm.)

Median: 10.2 cm. Mode: 10.2 cm.

Minimum: 9.4 cm. Maximum: 11.2 cm.

Table of frequencies:

	9.4-9.5 cm.	9.6-9.7 cm.	9.8-9.9 cm.	10.0-10.1 cm.	10.2-10.3 cm.	10.4-10.5 cm.	10.6-10.7 cm.	10.8-10.9 cm.	11.0-11.2 cm.
Number and per cent of cases.....	3	5	11	18	23	15	16	8	1

The correlations of the smallest frontal breadth with the greatest breadth of the head and that of the face are shown in the next table. A broader forehead is seen to correspond in general to a broader head as well as face; but on the average the breadth of the forehead increases in this series at a more rapid rate than either of the dimensions with which it is compared.

**KHARGA OASIS, MEN: RELATION OF DIAMETER FRONTAL MINIMUM TO
BREADTH OF FACE AND BREADTH OF HEAD**

19 narrowest foreheads: less than 10.0 cm.			19 broadest foreheads: 10.7 cm. and above		
Diameter frontal minimum	Diameter bizygomatic maximum	Greatest breadth of head	Diameter frontal minimum	Diameter bizygomatic maximum	Greatest breadth of head
cm.	cm.	cm.	cm.	cm.	cm.
9.4	12.1	13.0	10.7	13.6	14.6
9.4	13.7	14.1	10.7	12.9	14.2
9.4	13.8	14.4	10.7	13.4	14.1
9.6	12.8	13.4	10.7	13.6	13.9
9.6	12.0	13.2	10.7	13.4	15.0
9.7	12.9	13.8	10.7	13.4	14.2
9.7	13.3	14.0	10.7	13.3	13.9
9.7	12.6	13.8	10.7	13.1	14.4
9.8	13.0	14.4	10.7	13.1	14.2
9.8	13.2	13.4	10.7	13.9	14.3
9.8	13.8	13.4	10.8	12.8	14.7
9.8	13.0	13.3	10.8	13.9	14.1
9.8	13.8	14.2	10.8	13.4	14.0
9.8	12.6	14.0	10.8	12.9	13.4
9.8	12.5	13.6	10.9	13.0	14.0
9.9	12.5	13.9	10.9	13.7	14.2
9.9	12.6	14.8	10.9	13.2	14.4
9.9	13.0	14.5	10.9	13.6	14.6
9.9	13.1	13.9	11.2	13.4	14.3

Averages :

9.7 (9.4-9.9)	13.0 (12.0-13.8)	13.8 (13.0-14.8)	10.8 (10.7-11.2)	13.35 (12.8-13.9)	14.2 (13.4-15.0)
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Per cent :

100	74.6	70.3	100	80.9	76.1
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Averages and per cent that would exist if the relation of the measurements were the same as in the group with lowest foreheads.

(14.5) (83.1)	(15.4) (78.3)
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Width of the Mouth¹

One hundred observations on the Kharga men concerning this feature give the average of 5.4 cm., representing a medium dimension. The range of variation is not very large, extending over 13 mm. which represents ± 0.12 per unit of the average. The distribution is regular.

¹ Between the extremities of the oral fissure with the mouth closed and face at rest.

KHARGA OASIS, MEN: WIDTH OF THE MOUTH

Number of individuals measured: 100.

Average: 5.4 cm. (1st 50: 5.4; 2d 50: 5.4 cm.)

Median: 5.4 cm. Mode: 5.3 cm.

Minimum: 4.7 cm. Maximum: 6.0 cm.

	4.7 cm.	4.8-4.9 cm.	5.0-5.1 cm.	5.2-5.3 cm.	5.4-5.5 cm.	5.6-5.7 cm.	5.8-5.9 cm.	6.0 cm.
Number and per cent of cases.	3	5	15	18	21	18	16	4

The breadth of the mouth, as will be more clearly seen from the succeeding figures, bears to some extent a direct relation with the breadth of the nose, the breadth of the face and especially with age.

KHARGA OASIS, MEN: RELATION OF WIDTH OF MOUTH TO BREADTH OF FACE, BREADTH OF NOSE, AND TO AGE

23 narrowest mouths: 5.1 cm. and less				20 widest mouths: 5.8 cm. and more			
Width of mouth	Breadth of face	Breadth of nose	Age of individual	Width of mouth	Breadth of face	Breadth of nose	Age of individual
cm.	cm.	cm.	Years	cm.	cm.	cm.	Years
4.7	12.9	3.4	36	5.8	13.0	3.6	24
4.7	13.0	3.8	38	5.8	13.0	3.6	26
4.7	12.9	3.35	26	5.8	13.5	3.9	40
4.8	11.8	3.25	23	5.8	13.9	3.65	45
4.8	13.0	3.3	24	5.8	13.7	3.8	40
4.9	12.9	3.65	25	5.8	12.9	4.0	58
4.9	13.2	3.55	32	5.8	12.0	3.9	40
4.9	13.1	3.5	24	5.8	13.0	3.8	50
5.0	12.5	3.65	45	5.8	13.9	3.65	48
5.0	12.9	4.0	28	5.9	13.6	3.6	27
5.0	13.2	3.7	24	5.9	12.8	3.6	50
5.0	13.8	3.8	50	5.9	13.6	3.2	40
5.0	13.4	3.55	28	5.9	13.8	4.15	50
5.0	13.4	3.7	55	5.9	13.1	4.0	50
5.1	12.9	3.5	35	5.9	13.6	4.1	55
5.1	13.4	3.9	60	5.9	12.9	4.0	55
5.1	13.4	3.7	30	6.0	13.2	4.1	40
5.1	13.0	4.0	48	6.0	13.2	4.35	55
5.1	13.0	3.7	38	6.0	13.6	4.1	50
5.1	13.1	3.7	24	6.0	13.9	3.8	50
5.1	12.9	3.45	26				
5.1	13.2	3.5	28				
5.1	13.3	3.55	54				

Averages:

5.0	13.05 (11.8-13.8)	3.6 (3.25-4.0)	35 (23-60)	5.9	13.3 (12.0-13.9)	3.85 (3.2-4.35)	44 (24-58)
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The older adults at Kharga have in general broader mouths than the young adults, and a correspondence is frequently noticeable between broad noses and faces and broad mouths. The nose and mouth influence each other probably but very little, if at all, but both are affected alike by age and breadth of face.

The Bigonial Diameter of the Lower Jaw

The greatest lower facial breadth, or diameter bigonial, presents in the Kharga men the very moderate average of 10.3 cm. Weisbach¹ obtained in the Patagonians 13.0; Australians 11.5; Maori 11.4; northern Slavs and Roumanians 11.3; Tagalogs 11.1; southern Chinese, Magyars 11.0; Javanese 10.9; Gypsies 10.8; Hawaiians 10.7; Jews 10.6; Siamese, northern Chinese, Congo negroes 10.4; Japanese 10.2; Kaffirs 10.1; and Hottentots 9.2 cm.

The range of variation of the measurement in the Kharga series is 3.2 cm., equalling ± 0.156 per unit of the average, which is not above the ordinary. The distribution of the measurement is somewhat irregular, which is doubtless due to functional causes, or more directly, to uneven development of the masseters.

KHARGA OASIS, MEN: DIAMETER BIGONIAL OF LOWER JAW

Number of individuals measured: 100.

Average: 10.3 cm. (1st 50: 10.4; 2d 50: 10.2 cm.)

Median: 10.4 cm. Modes: 10 and 10.6 cm.

Minimum: 8.9 cm. Maximum: 12.1 cm.

Table of frequencies:

	8.9-9 cm.	9.1-9.2 cm.	9.3-9.4 cm.	9.5-9.6 cm.	9.7-9.8 cm.	9.9-10 cm.	10.1-10.2 cm.	10.3-10.4 cm.	10.5-10.6 cm.	10.7-10.8 cm.	10.9-11 cm.	11.1-11.2 cm.	11.3-12.1 cm.
Number and per cent of cases	1	3	3	6	8	12	11	10	19	13	6	5	3

The bigonial diameter bears a direct relation with the greatest breadth of the face and an indirect one with that of the head. But, as in the case of the breadth of the forehead, the dimension augments within the series at a greater rate than those with which it is compared, in other words it is enlarged to some extent through other agencies than the correlation with the breadth of the upper face

¹ L. c., pp. 279-280.

and the more distinct one with the head. These conditions are seen clearly in the following table.

The increase of the measurement with the increase in the breadth of the head is due on one hand to the correlation with the latter of the breadth of the upper face, which in turn influences the lower jaw; and on the other to the effect of the broad base of such a skull on the condyles and the ascending rami of the lower jaw. Broadening of the bigonial diameter independent of these factors is due almost entirely to the action of the masseters, which in some instances results in a marked eversion of the lower portion of the jaw at the angle.

KHARGA OASIS, MEN: RELATION OF DIAMETER BIGONIAL TO BREADTH OF FACE AND BREADTH OF HEAD

17 narrowest jaws: 9.7 cm. and below			14 broadest jaws: 10.9 cm. and above		
Diameter bigonial	Diameter bizygomatic maximum	Greatest breadth of head	Diameter bigonial	Diameter bizygomatic maximum	Greatest breadth of head
cm.	cm.	cm.	cm.	cm.	cm.
8.9	12.1	13.0	10.9	13.5	14.2
9.1	12.6	14.8	10.9	13.1	14.4
9.1	11.8	14.0	10.9	13.0	14.5
9.2	12.8	14.7	10.9	13.4	14.4
9.3	13.0	14.0	11.0	13.8	14.2
9.3	13.4	14.2	11.0	13.9	14.4
9.4	13.2	13.9	11.1	13.7	14.2
9.5	13.0	13.3	11.1	13.5	14.4
9.5	12.9	13.4	11.1	13.4	13.7
9.5	13.1	13.9	11.2	13.8	13.4
9.6	12.8	13.4	11.2	12.6	13.8
9.6	12.9	13.8	11.4	13.6	13.9
9.6	12.0	13.2	11.8	13.2	14.6
9.7	12.9	13.6	12.1	13.6	14.6
9.7	13.1	13.6			
9.7	13.6	14.2			
9.7	13.3	13.6			
Averages :					
9.4 (8 9-9.7)	12.85 (11.8-13.6)	13.8 (13.0-14.8)	11.2 (10.9-12.1)	13.4 (12.6-13.9)	14.2 (13.4-14.6)
Per cent :					
100	73.1	68.1	100	83.6	78.9
Averages and per cent that would exist if the relation of the measurements were the same as in the group with narrowest jaws.				(15.3) (87.1)	(16.4) (81.1)

The Ears

The dimensions of the ears possess certain anthropological value; the small ear of the negro is clearly separable from the larger one of the white, and there are probably other racial differences.

The writer measures invariably the left ear, which to a right-hand observer is more easily approachable with the instruments than that on the opposite side, and the measurements taken are the maximum height and the maximum breadth.¹

The average height of the ear obtained in Kharga men amounts to 6.3 cm., a relatively large proportion. Two hundred and fifteen ears (right and left) of Alsatian and German males from 20 to over 80 years of age gave Schwalbe the average ear height of 6.59; but the 125 of these ears from individuals between 20 and 59 years of age, representing a more suitable group for comparison than the total Schwalbe series which includes the ears of many old individuals, give the average of 6.33 cm.—much the same as at Kharga. The Alsations and Germans are, however, of decidedly taller mean stature than the Kharga natives, and stature exercises a certain amount of direct influence on the size of the ears irrespective of other conditions.

As to further comparative data, Weisbach records the ear height of 6.4 in the Javanese, 6.3 in the Japanese, 6.2 in Hawaiians, 6.1 in northern Chinese, Jews and Slavs, and 5.9 cm. in Gypsies and Kaffirs; while the writer obtained the average of 5.99 cm. in 20 apparently full-blood American negroes, and 6.76 cm. in 76 American Indians—all males. The short Kharga natives have therefore evidently an ear somewhat above the general average in length and differing very perceptibly in this respect from that of the negro.

The range of variation of the dimension amounts to 2.0 cm., or ± 0.159 per unit of the average. The distribution of the measurement is regular.

¹ They are the same as those of Topinard (*Eléments d'Anthropol. gén.*, Paris 1885, p. 1004 et seq.), Weisbach (*Zeit. f. Ethnologie*, IX, Supplement, Berlin, 1878), and Schwalbe (*Beiträge zur Anthropologie des Ohres*, Virchow's *Festschrift*, 1891, p. 95 et seq.) The breadth is measured at right angles to the height; the fixed branch of the sliding compass being applied, with some pressure, parallel to the long axis of the ear and so as to touch the anterior subcutaneous limit of the cartilaginous helix, while the movable branch is brought to touch the most posterior part of the skin of the pinna.

KHARGA OASIS, MEN: HEIGHT OF LEFT EAR

Number of individuals measured: 105.

Average: 6.3 cm. (1st 50: 6.33; 2d 50: 6.28 cm.)

Median: 6.3 cm. Modes: 6.2 and 6.4 cm.

Minimum: 5.4 cm. Maximum: 7.4 cm.

Table of frequencies:

	5.4 cm.	5.5-5.6 cm.	5.7-5.8 cm.	5.9-6 cm.	6.1-6.2 cm.	6.3-6.4 cm.	6.5-6.6 cm.	6.7-6.8 cm.	6.9-7 cm.	7.1-7.2 cm.	7.3-7.4 cm.
Number of cases.....	2	2	8	15	23	21	18	6	3	4	3
Per cent.....	1.9	1.9	7.6	14.3	21.9	20.0	17.1	5.7	2.9	3.8	2.9

The *breadth* of the ear in the Kharga natives averages 3.7 cm. In the above referred to Schwalbe's series of Alsations and Germans the same measurement averaged 3.97 cm., or, if we take only the group of 125 ears of individuals from 20 to 59 years of age, which is more comparable with the Kharga series, the mean breadth was 3.91 cm. The Kharga men have, evidently, an ear about equally as long, or only a trace shorter than the Alsatian and German whites, but one which is distinctly more narrow. The group of 20 American negroes measured by the writer, and who, notwithstanding their taller stature have been shown to possess a very noticeably shorter ear than the Kharga natives, gave a nearly equal breadth (3.69 cm.), as the latter, showing that their ear is relatively broader; while in the 76 Indians the measurements averaged 3.87 cm.

The range of variation in the breadth of the ear in the Kharga men extends 11 mm., which amounts to ± 0.149 per unit of the average. The distribution of the measurement is less uniform than that of the height of the ear.

KHARGA OASIS, MEN: BREADTH OF LEFT EAR

Number of individuals measured: 105.

Average: 3.7 cm. (1st 50: 3.77; 2d 50: 3.66 cm.)

Median: 3.7 cm. Mode: 3.7 cm.

Minimum: 3.3 cm. Maximum: 4.4 cm.

Table of frequencies:

	3.3-3.35 cm.	3.4-3.45 cm.	3.5-3.55 cm.	3.6-3.65 cm.	3.7-3.75 cm.	3.8-3.85 cm.	3.9-3.95 cm.	4.0-4.05 cm.	4.1-4.15 cm.	4.2-4.25 cm.	4.3-4.35 cm.	4.4 cm.
Number of cases.....	6	5	17	13	26	15	11	6	3	1	1	1
Per cent	5.7	4.8	16.2	12.4	24.8	14.3	10.5	5.7	2.9	1.0	1.0	1.0

The mean of the two measurements of the ear $\left(\frac{H+B}{2}\right)$ gives the "dimension" (*étendue*, Topinard) or *module* (Schwalbe) of the ear, a determination useful for comparison. In the Kharga series, the average ear module is 5.0, the least 4.4, and the greatest 5.75 cm. In the 20-59 year group of Schwalbe's series the module averages 5.12; in 13 male negroes measured by Topinard (l. c.) it was 4.78, in 8 "Europeans" 4.86, in 8 Melanesians 5.58 and in 3 Polynesians 5.2. In the 20 American negroes measured by the writer it was 4.84, in the 76 Indians 5.3. The mean size of the ear in the Kharga natives stands evidently nearer that of the whites than that of the negro, particularly when the stature differences are taken into consideration.

The percental relation of the breadth to the height of the ear $\left(\frac{B \times 100}{H}\right)$ gives the ear index, which is of some racial importance.

In the Kharga men it averages 58.9. Topinard (l. c.) obtained for 8 "Europeans" 54.0; 13 African negroes 61.2; 8 Melanesians 59.5 and 3 Polynesians 60.0; while in Schwalbe's series the index ranges from 61.5 in the adults between 20 and 59 to 58.7 in those between 70 and 79 years of age. The 20 American negroes measured by the writer gave the mean index of 61.6, the 76 Indians 57.2. The ear of the Kharga men may therefore be regarded as a relatively narrow one, in which respect it differs from that of the Alsations and the Germans, so far as represented in the Schwalbe series and especially from that of the negro.

The range of variation in the ear index in the Kharga men is rather large, extending over 17.4 units, or ± 0.148 per unit of the average. Its distribution is regular.

KHARGA OASIS, MEN: EAR INDEX

Number of individuals measured: 105.

Average: 58.9. (1st 50: 59.5; 2d 50: 58.3.)

Median: 59.0. Mode: group 58.5-60.0.

Minimum: 49.3. Maximum: 66.7.

Table of frequencies:

	49.3-50 ¹	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68
Number of cases.....	2	2	7	15	21	22	19	11	5	1
Per cent.....	1.9	1.9	6.7	14.3	20.0	20.9	18.1	10.5	4.8	1.0

¹ First group comprises indices to 50.5, second from 50.6 to 52.5, etc.

The dimensions of the ear differ in the whites, it was shown by Schwalbe,¹ with age, both the height and the breadth, but especially the former, increasing up to at least the 70th year of age. The module and ear index modify accordingly, the module increasing, the index decreasing; in the words of the just mentioned author,² "the ear in the aged is on the average absolutely longer and broader, but *relatively* narrower, than that in the young adult. The same conditions were found by the writer in the Indians, and they also exist among the Kharga Egyptians. As seen from the following table, the average height of the ear in the seventeen oldest men of the series is to that of the seventeen youngest adults as 109.9 to 100; the breadth is as 104.2 to 100; the module or mean diameter as 107.7 to 100; while the cephalic index is but as 94.6 to 100. We are dealing here evidently with morphological conditions of wide extension, in which racial or tribal differences are restricted to degree and other secondary features of the phenomena.

KHARGA OASIS, MEN: DIMENSIONS OF EARS ACCORDING TO AGE

17 youngest men: 21-26 years				17 oldest men: 55-65 years			
Age of subject	Height of left ear	Breadth of left ear	Ear index	Age of subject	Height of left ear	Breadth of left ear	Ear index
<i>years</i>	<i>cm.</i>	<i>cm.</i>		<i>years</i>	<i>cm.</i>	<i>cm.</i>	
21	6.0	3.55	59.2	55	7.1	4.3	60.6
22	6.1	3.85	63.1	55	6.2	3.3	53.2
23	5.8	3.8	65.5	55	6.65	3.9	58.6
23	5.4	3.45	63.9	55	6.3	3.9	61.9
24	6.1	3.3	54.1	55	6.1	3.9	63.9
24	6.0	3.6	60.0	55	6.7	3.75	56.0
24	6.4	3.8	59.4	55	5.8	3.6	62.1
24	5.7	3.3	57.9	55	7.0	3.8	54.3
24	6.4	3.75	58.6	55	6.3	3.5	55.6
25	5.4	3.5	64.8	55	6.2	3.5	56.4
25	5.9	3.3	55.9	55	7.3	4.2	57.5
25	6.0	3.75	62.5	58	7.1	3.5	49.3
26	6.45	3.65	56.6	60	6.9	4.0	58.0
26	6.3	3.7	58.7	60	7.3	3.7	50.7
26	6.2	3.65	58.9	60	6.4	3.5	54.7
26	6.4	3.7	57.8	60	6.5	3.5	53.8
26	6.5	3.5	53.8	65	7.4	3.8	51.3

Averages :

24.4 (21-26)	6.05 (5.4-6.5)	3.6 (3.3-3.85)	59.5 (53.8-65.5)	57 (55-65)	6.65 (5.8-7.4)	3.75 (3.3-4.3)	56.3 (49.3-63.9)
Module : 4.8 cm.				5.2 cm.			

General averages of the whole series (105) : Height 6.3; breadth 3.7; module 5.0 cm.; index 58.9.

¹ L. c., pp. 123-124 et seq.

² Ibid., p. 144.

ADDITIONAL MEASUREMENTS

It was, regrettably, impracticable to secure at Kharga any measurements of the covered parts of the body. It was observed that the chest, abdomen and pelvic regions are in general moderately developed, and so far as could be perceived they present no uncommon features. It was possible, however, to measure the hands, feet and the calf of the leg, with the following results.

The Hand

On the hand the writer takes two measurements, the length and breadth. The length is taken in full extension of the hand from the middle of a straight line connecting the proximal boundaries of the thenar and hypothenar eminences, to the tip of the longest finger. The line frequently, but not always, coincides with a delimiting folding or wrist line in the skin. The breadth measured is the maximum breadth of the palm, taken, in full extension of the hand, from the angle between the thumb and the palm across the latter at right angles to the length. These measurements secure, the writer believes, the expression of the racial features of the hand better than others. And in view of the fact that the right hand is often more modified by the work or habits of the individual than the left, measurements are restricted to the latter.

At Kharga the left hand was measured in 100 men, and the following two tables show the results.

KHARGA OASIS, MEN: LENGTH OF LEFT HAND

Number of individuals measured: 100.

Average: 19.0 cm. (1st 50: 19.1; 2d 50: 18.9 cm.)

Median: 18.9 cm. Modes: 18.6 and 19.7 cm.

Minimum: 17.2 cm. Maximum: 21.7 cm.

Table of frequencies:

	17.2-17.5 cm.	17.6-18 cm.	18.1-18.5 cm.	18.6-19 cm.	19.1-19.5 cm.	19.6-20 cm.	20.1-20.5 cm.	20.6-21 cm.	21.1-21.5 cm.	21.7 cm.
Number and per cent of cases..	1	11	18	26	15	19	6	2	1	1

KHARGA OASIS, MEN: BREADTH OF LEFT HAND

Number of individuals measured: 100.

Average 8.8 cm. (1st 50: 8.9; 2d 50: 8.7 cm.)

Median: 8.9 cm. Mode: 9.1 cm

Minimum: 7.7 cm. Maximum: 9.8 cm.

Table of frequencies:

	7.7-7.8 cm.	7.9-8 cm.	8.1-8.2 cm.	8.3-8.4 cm.	8.5-8.6 cm.	8.7-8.8 cm.	8.9-9 cm.	9.1-9.2 cm.	9.3-9.4 cm.	9.5-9.6 cm.	9.7-9.8 cm.
Number and per cent of cases.....	2	1	8	8	13	17	19	17	9	4	2

It is seen that the average length and especially the average breadth of the hand are moderate. The range of the variation is proportionate, extending for the length over 4.5 cm., or ± 0.118 per unit of the mean, and for the breadth over 1.9 cm., or ± 0.108 per unit of the mean. The hand module $\left(\frac{L + B}{2} \right)$ averages 13.9, the hand index $\left(\frac{B \times 100}{L} \right)$ 46.3.

The Foot

Conformably with the practice of measuring the left ear and especially the left hand, the writer measures also the left foot. The dimensions ascertained are the maximum length and maximum breadth (back of the toes), while the foot reposes so lightly on the floor that there is no deformation. The results of such measurements on 103 of the Kharga men are as follows:

KHARGA OASIS, MEN: LENGTH OF LEFT FOOT

Number of individuals measured: 103.

Average: 25.4 cm. (1st 50: 25.6 cm.; 2d 50: 25.2 cm.)

Median: 25.5 cm. Modes: 24.6 and 26.2 cm.

Minimum: 20.3 cm. Maximum: 28.4 cm.

Table of frequencies:

	20.3 cm.	22.7 cm.	23.1-23.5 cm.	23.6-24 cm.	24.1-24.5 cm.	24.6-25 cm.	25.1-25.5 cm.	25.6-26 cm.	26.1-26.5 cm.	26.6-27 cm.	27.1-27.5 cm.	27.6-28 cm.	28.1-28.4 cm.
Number of cases.	1	2	3	9	7	18	15	13	16	9	5	3	2
Per cent	1.0	1.9	2.9	8.7	6.8	17.5	14.6	12.6	15.5	8.7	4.9	2.9	1.9

KHARGA OASIS, MEN: BREADTH OF LEFT FOOT

Number of individuals measured: 103.

Average: 10.0 cm. (1st 50: 10.1; 2d 50: 9.9 cm.)

Median: 10.0 cm. Mode: 10.1 cm.

Minimum: 8.8 cm. Maximum: 11.2 cm.

Table of frequencies:

	8.8 cm.	8.9-9 cm.	9.1-9.2 cm.	9.3-9.4 cm.	9.5-9.6 cm.	9.7-9.8 cm.	9.9-10 cm.	10.1-10.2 cm.	10.3-10.4 cm.	10.5-10.6 cm.	10.7-10.8 cm.	10.9-11 cm.	11.1-11.2 cm.
Number of cases.	3	2	4	4	13	14	14	14	14	8	8	3	2
Per cent	2.9	1.9	3.9	3.9	12.6	13.6	13.6	13.6	13.6	7.8	7.8	2.9	1.9

The preceding data show that the foot of the Kharga men, like the hand, is of moderate proportions. The individual variation is but slightly larger than in the hand; it extends for the length over 8.1 cm., or ± 0.159 per unit of the average, and for the breadth over 2.4 cm. or ± 0.120 per unit of the average. The mean module of the foot $\left(\frac{L+B}{2}\right)$ 17.1, the mean index $\left(\frac{B \times 100}{L}\right)$ 39.4. These dimensions will be mainly useful for future comparisons.

An inquiry as to the bearing of stature on the absolute and relative dimensions of the hands and feet, brings out interesting results. As will be seen from the following figures, there is a clear, direct correlation between the height of the body and length (as well as breadth) of the hands as well as the feet; but the index in each case shows but little alteration. The correlation between the stature and the hand and foot length is so close that proportions of the latter to the stature are almost identical in the shortest and the tallest groups of the series, and the little change in the index shows that the same must be true of the breadth of the two parts.

Another inquiry was directed into the effects on the hand and foot dimensions of age, and the results of this are wholly negative. The differences in the mean hand and foot length (as well as breadth) and their indices between the group of the youngest and that of the oldest men (both groups showing nearly equal average of stature), are so small as to be quite negligible.

KHARGA OASIS, MEN: RELATION OF THE LENGTH OF THE HANDS AND FEET, AND OF THEIR INDICES, TO STATURE AND AGE

Length and Indices of Hands and Feet in Shortest and Tallest Individuals

17 SHORTEST MEN: 158.5 CM. AND BELOW

Stature	Length of left hand	Hand index	Length of left foot	Foot index
<i>cm.</i>	<i>cm.</i>		<i>cm.</i>	
152.3	18.8	47.3	23.7	40.5
153.6	18.3	47.0	20.3	46.8
154.5	17.6	44.3	23.3	37.8
155.2	18.3	47.2	24.1	42.7
155.7	18.0	50.6	24.6	44.2
155.7	18.3	44.8	24.2	40.1
155.9	18.6	45.2	24.9	39.8
156.0	18.3	45.9	23.5	38.3
156.5	18.6	43.0	24.7	36.4
157.5	18.1	47.0	23.9	36.8
157.6	18.9	46.0	25.1	39.8
157.8	17.9	43.0	23.2	40.1
158.3	18.4	47.3	23.9	41.0
158.3	18.2	46.7	24.2	40.5
158.4	18.8	46.8	24.7	42.1
158.5	18.3	45.4	24.1	37.7
158.5	18.6	44.1	25.4	39.8

Averages:

156.5 (152.3-158.5) Proportion to stature (5=1000)	18.4 (17.6-18.9) 117.5	46.0 (40.3-50.6)	24.0 (20.3-25.4) 153.4	40.3 (36.4-46.8)
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17 TALLEST MEN: ABOVE 168.5 CM.

Stature	Length of left hand	Hand index	Length of left foot	Foot index
<i>cm.</i>	<i>cm.</i>		<i>cm.</i>	
168.6	19.9	49.2	28.4	38.4
168.6	20.0	45.5	26.3	39.4
168.8	19.4	45.9	25.2	38.5
168.8	21.7	40.5	27.7	37.6
168.9	19.9	46.7	26.2	38.5
169.4	18.6	44.6	25.0	38.0
169.4	18.6	47.8	24.8	38.3
169.4	20.4	45.6	26.2	38.2
170.5	19.7	45.7	27.2	38.4
171.3	19.6	46.4	26.9	39.7
172.2	18.5	48.1	25.5	41.9
172.4	19.7	48.7	25.7	42.0
172.4	20.1	47.3	26.9	38.7
172.5	19.4	46.9	26.2	38.5
172.7	19.9	46.2	25.9	40.1
173.8	21.5	44.6	27.2	39.3
174.5	19.4	48.4	27.1	38.7

Averages:

170.8 (168.6-174.5)	19.8 (18.5-21.7) 115.9	46.4 (40.5-49.2)	26.4 (24.8-28.4) 154.6	39.1 (37.6-42.0)
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**KHARGA OASIS, MEN: RELATION OF THE LENGTH OF THE HANDS AND FEET,
AND OF THEIR INDICES, TO STATURE AND AGE—Continued**

Length and Indices of Hands and Feet in Youngest and Oldest Individuals

17 YOUNGEST MEN: 21 TO 26 YEARS OF AGE

Approximate age	Length of left hand	Hand index	Length of left foot	Foot index
<i>Years</i>	<i>cm.</i>		<i>cm.</i>	
21	18.4	46.2	23.7	42.1
22	19.1	47.6	24.7	38.8
23	19.3	43.5	25.7	38.5
23	17.9	43.0	23.2	40.1
24	18.9	47.6	25.2	42.1
24	18.7	44.2	25.7	37.3
24	21.7	40.5	27.7	37.6
24	19.0	47.9	26.2	38.2
24	17.9	47.5	22.7	43.2
25	18.1	47.0	23.9	36.8
25	17.6	46.6	22.7	40.5
25	19.4	43.8	25.8	39.1
26	18.9	50.3	26.2	39.3
26	20.3	46.3	27.2	38.2
26	18.6	47.8	24.8	38.3
26	19.6	44.4	25.0	37.2
26	19.7	46.2	27.6	39.1

Averages:

24.4 (21-26)	19.0 (17.6-21.7)	45.9 (40.5-50.3)	25.2 (22.7-27.7)	39.2 (37.2-43.2)
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17 OLDEST MEN: 55 TO 65 YEARS OF AGE

Approximate age	Length of left hand	Hand index	Length of left foot	Foot index
<i>Years</i>	<i>cm.</i>		<i>cm.</i>	
55	18.6	44.1	23.9	41.0
55	18.5	48.1	25.5	41.9
55	18.7	49.7	26.3	41.4
55	19.0	45.8	25.8	38.8
55	18.0	47.8	24.9	40.6
55	18.6	43.0	24.7	36.4
55	18.9	46.0	25.1	39.8
55	17.9	45.8	25.4	38.6
55	18.3	44.8	24.2	40.1
55	18.3	49.7	25.5	38.4
55	20.7	44.9	26.7	41.2
58	18.5	45.9	24.6	39.0
60	19.1	49.2	25.6	40.2
60	19.7	45.2	25.9	40.1
60	19.0	45.8	25.7	39.3
60	18.7	45.4	24.8	38.3
65	17.2	47.1	23.6	39.4

Averages:

57 (55-65)	18.7 (17.2-20.7)	46.4 (43.0-49.7)	25.2 (23.6-26.7)	39.7 (36.4-41.9)
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The average stature of the 17 youngest men is 162.5 cm., that of the 17 oldest 161.8 cm.—no influential difference.

Girth of the Leg

The maximum girth of the leg is a measurement which in the main indicates the individual development of the musculature of the part, but collectively is also of some anthropological significance, for regardless of age, health, nourishment and exercise of the part, all of which agencies affect its dimension, there are certain peoples, such as the Indians for instance, who have in general a smaller calf than the whites.

The average maximum circumference of the left leg, which is measured by the writer, amounts in white men less than 50 years of age, to about 36 cm., in the Indian the writer obtained, on 200 individuals in good state of bodily preservation, 34.0 cm., and in 20 apparently full-blood American negroes 36.9 cm. One hundred and eleven Kharga men in good condition gave the mean of only 32.0 cm., and in more than a half the measurement was smaller. The significance of this relatively poor record is doubtless in the main not racial, but connected with the poor nutrition of the majority of the Oasis people and their consequent subnormal development, which was shown already by other determinations.

KHARGA OASIS, MEN: MAXIMUM GIRTH OF LEG

Number of observations: III.¹

Average: 32.0 cm. (1st 50: 32.1; 2d 50: 31.9 cm.)

Median: 31.5 cm. Mode: 31.0-32.0 cm.

Minimum: 27.3 cm. Maximum: 37.0 cm.

Table of frequencies:

	27.1-28 cm.	28.1-29 cm.	29.1-30 cm.	30.1-31 cm.	31.1-32 cm.	32.1-33 cm.	33.1-34 cm.	34.1-35 cm.	35.1-36 cm.	36.1-37 cm.
Number of cases....	2	3	11	22	23	20	17	9	3	1
Per cent.....	1.8	2.7	9.9	19.8	20.7	18.0	15.3	8.1	2.7	0.9

¹ No cases of plain emaciation, senile or otherwise, included.

SUMMARY OF THE MAIN RESULTS SHOWN BY MEASUREMENTS; TABLES OF COMPARISON

The Kharga men are, on the average, of short stature; the head is of moderate size, medium height and dolicho- to mesocephalic in form; the face is rather narrow, the nose mesorhynian, the mouth of fair size; the ears are rather long and narrow, the hands and feet of medium proportions, the legs small. In general the measurements indicate a rather poor physical development.

The principal available data for comparison of the measurements are gathered in the following tables. The first of these shows the close relations of the Kharga natives with the Copt, Fellaheen and the non-negro Nubian; the second demonstrates the important differences between the Oasis men and the Nubian, Soudanese and the other negroes.

COMPARISON OF MEASUREMENTS OF THE KHARGA NATIVES AND VARIOUS OTHER GROUPS OF EGYPTIANS AND NUBIANS (MALES)

Males	Author	Stature	Head		
			Length	Breadth	Cephalic index
		<i>cm.</i>	<i>cm.</i>	<i>cm.</i>	
150 Kharga Oasis	Hrdlička	163.8	18.9	14.1	74.9
127 Copts	Chantre	166.0	18.85	14.2	75.2
91 Fellaheen	Chantre	168.4	19.0	14.2	74.7
134 Bedouins	Chantre	167.8	19.27	14.25	73.9
81 Ababdeh	Chantre	166.0	18.9	14.1	74.6
64 Barabra	Chantre	168.2	18.9	14.4	76.4
78 Bicharieh	Chantre	165.0	18.1	14.3	79.0
369 Egyptian Moslems, selected	Myers	(171.0)	19.46	14.43	74.26
44 Copts, selected	Myers	(171.0)	19.30	14.31	74.0

Males	Face		Nose			Mouth breadth
	Chin-nasion height	Diameter bizygomatic maximum	Height	Breadth	Nasal index	
		<i>cm.</i>	<i>cm.</i>	<i>cm.</i>		
150 Kharga Oasis	11.35	13.15	4.87	3.73	76.6	5.4
127 Copts .....	...	13.25	(4.7) ¹	3.6	(77.6)	5.2
91 Fellaheen .....	...	12.93	(4.6)	3.7	(81.0)	5.1
134 Bedouins .....	...	13.2	(4.65)	3.56	(76.6)	5.1
81 Ababdeh .....	...	13.1	(4.5)	3.7	(82.2)	5.2
64 Barabra .....	...	13.0	(4.60)	3.8	(81.1)	5.3
78 Bicharieh .....	...	12.7	(4.6)	3.5	(76.1)	5.0
369 Egyptian Moslems, selected	11.45 ²	14.36 ³	4.83	3.66	75.83 ⁴	...
44 Copts, selected	11.47	13.66 ⁵	4.78	3.59	75.77 ⁶	...

¹ All Chantre's measurements of the height of the nose are evidently too low; no such low averages of nasal height have been reported on non-negro populations of North Africa by any other observer.

² 595 individuals.

³ 698 individuals.

⁴ Of 349 individuals.

⁵ 33 individuals.

⁶ Of 42 individuals.

**COMPARISON OF THE MEASUREMENTS OF THE KHARGA MEN WITH THOSE
OF SOUDANESE AND OTHER NEGROES**

Peoples (males)	Kharga Oasis	Negroes: Nilotic group	Negroes: Nubian group	Negroes: American (full blood)
Observers	Hrdlička	Chantre	Chantre	Hrdlička
Number of cases.....	150	35	26	20
Mean age, years.....	40	.....	.....	36.2
Stature, cm.....	163.8	174.1	169.0	168.6
Height sitting, per cent of total height	51.26	.....	.....	51.43
Head:				
Length, cm.....	18.9	18.94	18.98	19.6
Breadth, cm.....	14.1	13.95	14.1	15.0
Bi-meatus line-bregma height, cm	13.2	.....	.....	13.5
Cephalic index.....	74.9	73.66	74.53	76.3
Cephalic module, cm.	15.4	.....	.....	16.0
Per mille relation of cephalic mod- ule to stature.....	94.0	.....	.....	95.0
Face:				
Chin-nasion, cm.....	11.35	.....	.....	11.9
Chin-hair line, cm.....	17.6	.....	.....	17.95
Height of forehead, cm.....	6.2	.....	.....	6.05
Diam. bizygomatic max., cm.....	13.15	13.3	13.26	13.97
Facial index, physiognomic.....	86.3	.....	.....	85.1
Facial index, anatomic.....	74.7	.....	.....	73.5
Nose:				
Height, cm.....	4.87	4.08	4.2	4.9
Breadth, cm.....	3.73	4.3	4.42	4.57
Index.....	76.6	105.4	105.0	92.5
Diam. frontal min., cm.....	10.3	.....	.....	10.6
Diam. bigonial, cm.....	10.3	.....	.....	10.8
Mouth, width, cm.....	5.4	5.3	5.2	5.7
Left ear:				
Height, cm.....	6.3	.....	.....	5.99
Breadth, cm.....	3.7	.....	.....	3.69
Index.....	58.9	.....	.....	61.6
Left hand:				
Length, cm.....	19.0	.....	.....	20.0
Breadth, cm.....	8.8	.....	.....	9.15
Index.....	46.3	.....	.....	45.7
Left foot:				
Length, cm	25.4	.....	.....	26.8
Breadth, cm.....	10.0	.....	.....	10.3
Index	39.4	.....	.....	38.3
Left leg, circumference, cm	32.0	.....	.....	36.9

9. CONCLUSIONS

The Kharga Oasis Egyptians are people in general of somewhat subnormal physical development, due principally to long lasting defective nutrition.

The majority of the people are as yet but little mixed with the negro.

Those who are not mixed with the blacks, show a fairly uniform physical type. This type is characterized by medium brown skin, horizontal brown eye, black and straight hair (with a tendency to wave when longer), black, straight, wavy or slightly curly and often scanty beard, moderate stature, dolicho- to mesocephalic and medium high head, oblong and meso- to orthognathic face, mesorhinic nose, rather long and narrow ear, and moderately proportioned chest, pelvis, hands and feet. They give somewhat higher pulse and respiration than the average in whites, but perceptibly lower temperature, and decidedly lower muscular force.

The type of the Kharga natives is radically distinct from that of the negro. It is according to all indications fundamentally the same as that of the non-negroid Valley Egyptians. It is in all probability a composite of closely related northeastern African and southwestern Asiatic, or "hamitic" and "semitic" ethnic elements, and is to be classed with these as part of the southern extension of the Mediterranean subdivision of the white race.

Judging from the mummies of the Oasis inhabitants from the 2-5 centuries A. D., exhumed at El Baguat, the type of the present non-negroid Kharga natives is substantially the same as that of the population of the Oasis during the first part of the Christian era. The nature of the population of the Oasis in more ancient times can only be determined by skeletal material from the ancient cemeteries.

In order to facilitate the general use or more extended analysis of the data, the detailed measurements are appended. There is also added a bibliography relating or referring to the Kharga Oasis population.

10. BIBLIOGRAPHY RELATING OR REFERRING TO THE KHARGA OASIS POPULATION

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11. APPENDIX KHARGA OASIS, MEN: DETAILED MEASUREMENTS

Number.	Sex.	Approximate age.	Height.	Sitting height.	Sitting height per cent of total length.	Head: d. ant. post.	D. lateral max.	Cephalic index.	Height line bet. and-meant to bregma	Cephalic module	Cephalic module vs.	Face: Menton-nasion	Menton-crinion	Height of forehead (nasion-crinion)	Diam. bizygom. max.	Facial index		Nose: height to nasion	Nose, width, max.	Nasal index
																Anatomic	Physiognomic			
1	M	55	162.2	86.9	53.25	19.5	14.7	75.38	13.6	15.93	97.6	12.4	...	...	12.8	96.9	...	5.8	4.2	72.41
2	"	36	161.7	86.9	53.74	18.6	14.4	77.42	13.0	15.33	94.8	11.8	18.4	6.6	12.9	91.5	70.1	5.0	3.4	68.00
3	"	55	172.2	87.6	50.87	19.0	14.6	76.84	13.3	15.63	90.8	11.1	17.5	6.4	13.4	82.8	76.6	5.15	4.15	80.98
4	"	27	158.3	84.8	53.57	18.5	13.9	75.14	13.0	15.30	96.7	10.8	...	...	13.1	82.4	...	4.5	3.55	78.39
5	"	50	168.3	88.4	52.53	18.7	13.6	72.73	12.95	15.08	89.5	12.4	18.2	5.8	12.9	96.1	70.9	5.05	3.8	75.25
6	"	50	160.2	83.9	52.37	18.9	14.2	75.13	13.25	15.45	96.4	12.0	18.2	6.2	13.8	87.0	75.8	5.3	3.8	71.70
7	"	24	162.3	83.1	51.20	19.1	14.4	75.39	13.5	15.67	96.5	11.0	18.0	7.0	13.0	84.6	72.2	5.0	3.6	72.00
8	"	26	163.1	85.6	52.48	19.0	13.6	71.58	12.8	15.13	92.8	12.1	18.5	6.4	13.0	93.1	70.3	5.0	3.6	72.00
9	"	27	163.3	83.2	50.95	20.0	14.6	73.60	13.55	16.05	88.3	11.4	17.6	6.2	13.6	83.8	77.3	4.6	3.6	78.26
10	"	27	173.8	85.5	49.20	19.0	14.0	73.68	13.1	15.37	88.4	11.4	17.6	6.2	13.0	87.7	73.9	4.7	3.85	81.91
11	"	28	166.1	86.7	52.20	20.0	14.5	72.50	13.4	15.97	96.1	12.6	19.3	6.7	13.4	94.0	69.4	4.7	3.55	75.53
12	"	32	172.4	84.8	49.19	18.6	14.0	75.27	12.8	15.13	87.8	12.3	17.9	5.6	13.2	93.2	73.7	5.2	2.95	56.73
13	"	40	171.3	87.4	51.02	19.9	14.5	72.86	14.15	16.18	94.5	11.8	18.7	6.9	13.2	89.4	70.6	5.25	4.1	78.11
14	"	38	163.7	87.3	53.33	18.0	14.0	77.78	12.5	14.83	90.6	9.6	15.4	5.8	13.0	73.85	84.4	4.5	3.8	84.44
15	"	35	159.3	81.5	51.10	19.5	14.2	72.82	13.1	15.60	97.9	11.7	17.8	6.1	12.9	90.7	72.5	4.9	3.5	71.43
16	"	60	160.8	84.2	52.36	18.1	13.6	75.14	13.1	14.93	92.8	12.0	17.8	5.8	13.1	91.6	73.6	5.1	4.5	88.24
17	"	50	152.3	80.4	52.79	18.0	14.3	79.44	13.35	15.22	99.9	10.5	17.2	6.7	12.8	82.0	74.4	4.5	4.0	88.89
18	"	55	164.4	84.4	51.34	18.6	14.0	75.27	13.55	15.38	93.6	11.7	17.4	5.7	13.4	87.3	77.0	5.1	3.7	72.55
19	"	40	172.7	88.3	51.13	19.0	14.6	76.84	13.05	15.55	90.0	12.0	17.9	5.9	13.5	88.9	75.4	5.45	3.9	71.57
20	"	55	165.0	86.8	52.61	19.7	14.3	74.99	13.3	15.77	95.6	12.2	...	6.8	13.2	92.4	...	5.0	4.1	82.00
21	"	45	172.4	87.1	50.32	19.9	14.2	71.36	13.55	15.88	92.1	11.6	18.4	5.3	13.4	86.6	72.8	5.1	4.0	78.43
22	"	60	161.3	83.3	51.64	19.0	14.4	75.79	13.4	15.60	96.7	abt. 11.5 (15.8)	...	...	13.4	78.4	...	4.8	3.9	81.25

23	M	45	166.1	84.9	51.11	19.2	14.1	73.44	12.8	15.37	92.5	12.9	....	...	13.9	92.8	....	5.0	3.65	73.00
24	"	30	167.1	85.6	51.23	19.0	14.2	74.74	13.85	15.68	93.8	11.7	17.8	6.1	13.7	85.4	77.5	4.95	3.8	76.78
25	"	30	165.0	84.7	51.33	19.2	14.1	73.44	13.7	15.67	95.0	11.4	17.3	5.9	13.4	85.1	77.0	3.6	3.6	73.47
26	"	65	161.5	83.4	51.04	19.0	13.6	71.58	12.8	15.13	93.7	11.2	16.8	5.6	13.2	84.85	78.6	5.0	3.4	68.00
27	"	30	164.7	85.4	51.85	18.2	14.5	79.67	13.55	15.42	93.6	11.5	17.6	6.1	13.4	85.8	76.1	5.1	3.7	72.55
28	"	50	160.4	86.1	50.83	18.5	13.4	72.43	12.55	14.82	87.5	10.5	14.6	4.1	13.2	79.55	....	4.5	4.2	92.33
29	"	50	160.0	81.0	50.63	18.7	13.4	71.66	12.35	14.82	92.6	10.7	17.2	6.5	12.8	83.6	74.4	4.95	3.6	72.73
30	"	40	155.7	81.4	52.28	19.6	13.9	70.92	13.05	15.52	99.7	11.8	18.8	7.0	13.6	86.8	72.3	4.5	3.2	71.11
31	"	45	166.5	84.2	50.57	18.9	13.4	70.90	12.95	15.08	90.6	11.7	16.2	4.5	12.5	93.6	77.2	4.9	3.65	74.40
32	"	45	163.0	84.5	51.84	19.0	15.2	80.00	13.4	15.87	97.4	10.0	17.2	7.2	13.8	72.5	80.2	4.6	3.9	84.78
33	"	55	162.5	81.6	50.22	19.0	14.0	73.70	13.35	15.45	95.1	11.2	17.6	6.4	13.5	83.0	76.7	5.0	3.7	74.00
34	"	28	159.6	80.9	50.69	19.1	14.2	74.35	13.8	15.70	98.4	12.5	17.8	5.3	12.9	103.2	72.5	4.7	4.0	85.11
35	"	23	165.8	83.6	50.42	18.6	14.85	79.84	13.0	15.48	93.4	11.4	17.1	5.7	13.5	84.4	78.9	4.9	3.55	72.45
36	"	40	162.5	86.8	53.42	19.0	13.8	72.63	12.75	15.18	93.4	11.6	17.8	6.2	13.0	89.2	73.0	4.9	3.9	79.59
37	"	25	157.5	82.1	52.13	17.7	13.0	73.45	13.2	14.63	92.9	10.1	16.1	5.0	12.1	83.5	75.2	4.6	3.75	81.52
38	"	40	161.7	82.8	51.21	18.8	14.3	76.06	13.2	15.43	95.4	12.7	19.5	6.8	13.4	94.8	68.7	5.5	3.6	65.45
39	"	55	156.5	79.0	50.48	19.5	13.9	71.28	13.2	15.53	90.2	10.7	....	....	13.2	81.1	....	4.6	4.35	94.56
40	"	28	168.3	86.5	51.40	18.8	15.0	79.79	13.6	15.80	93.9	12.0	19.0	7.0	13.4	89.55	70.5	5.4	3.6	66.67
41	"	26	168.2	86.8	51.57	19.8	14.4	72.72	14.1	16.10	95.7	11.6	19.2	7.6	13.2	87.9	68.7	4.8	3.7	77.08
42	"	48	168.2	89.9	53.45	19.2	14.3	74.48	13.2	15.57	92.6	11.2	....	....	13.0	86.15	....	5.0	4.0	80.00
43	"	45	167.3	86.8	51.88	19.3	14.25	73.85	13.25	15.60	93.2	11.9	18.3	6.4	13.4	88.8	73.2	4.9	3.55	72.45
44	"	60	165.5	82.9	50.09	18.7	13.8	73.80	13.2	15.23	92.0	11.6	17.8	6.2	13.1	88.55	73.6	5.0	4.15	83.00
45	"	26	160.4	83.3	49.17	17.7	13.8	77.97	12.85	14.78	87.2	11.3	16.7	5.4	12.9	87.6	77.2	4.4	3.35	76.13
46	"	55	157.6	82.4	52.29	18.9	13.8	73.02	13.3	15.30	97.1	11.5	16.2	4.7	12.5	89.15	79.6	4.55	4.2	92.31
47	"	22	162.0	84.9	52.41	19.1	13.9	72.78	12.8	15.27	94.3	11.0	17.1	6.1	12.9	88.0	73.1	4.9	3.8	77.55
48	"	50	168.6	86.2	51.13	20.4	14.6	71.57	13.4	16.13	95.7	11.5	....	....	13.6	84.6	....	5.4	4.1	75.93
49	"	45	165.2	87.3	52.85	19.2	14.2	77.08	13.0	15.67	94.9	9.8	15.8	6.0	12.6	77.8	79.7	4.2	3.9	92.86
50	"	27	161.5	81.1	50.22	18.9	14.8	75.13	13.45	15.52	96.1	11.6	18.0	6.4	13.2	87.9	73.3	4.8	3.9	81.25
51	"	55	160.7	82.8	51.52	18.8	13.4	71.28	12.75	14.98	93.2	12.1	18.3	6.2	13.8	87.7	75.4	4.8	3.5	72.92
52	"	32	168.9	88.1	52.16	19.0	14.2	74.75	13.0	15.40	91.2	12.1	18.3	6.2	13.5	89.6	73.8	5.5	3.8	69.09
53	"	58	161.6	84.4	52.23	19.3	14.2	73.58	13.75	15.75	97.5	11.3	17.8	6.5	12.9	87.6	72.5	5.4	4.0	74.07
54	"	38	168.8	85.7	50.77	19.1	13.3	69.63	13.05	15.15	89.8	11.5	17.8	6.3	13.0	88.5	73.0	4.5	3.7	82.22
55	"	50	174.5	90.4	51.81	18.3	14.2	77.60	13.45	15.32	87.8	11.6	16.7	5.1	13.8	84.1	82.6	5.0	4.15	83.00
56	"	45	168.6	86.2	51.13	18.6	13.9	74.73	12.9	15.13	89.7	10.9	16.7	5.8	13.3	81.95	79.6	4.6	4.0	86.96

KHARQA OASIS, MEN: DETAILED MEASUREMENTS (Continued)

Number	Sex	Approximate age	Height	Sitting height	Sitting height per cent of total length	Head: d. ant. post.	D. lateral max.	Cephalic index	Height line bet. and-meant to bregma	Cephalic module	Cephalic module vs. height	Face: Menton-nasion	Menton-crinion	Height of forehead (nasion-crinion)	Diam. bizygom. max.	Facial index		Nose: height to nasion	Nose, width, max.	Nasal index.
																Anatomic				
																	Physiognomic			
57	M	25	162.0	84.6	52.22	17.6	14.0	79.55	13.0	14.87	91.8	11.4	17.2	5.8	12.9	88.4	75.0	4.6	3.5	79.35
58	"	50	167.4	84.8	50.66	18.7	13.6	72.73	13.35	15.22	90.9	11.0	15.8	4.8	13.1	84.0	82.9	4.6	4.0	86.96
59	"	40	159.4	81.8	51.32	18.75	13.25	70.67	13.05	15.02	94.2	10.8	17.0	6.2	12.0	90.0	70.6	4.1	3.9	95.12
60	"	23	157.8	75.8	48.04	17.8	14.0	78.65	12.6	14.80	93.8	10.9	17.9	6.0	11.8	92.4	....	4.7	3.25	69.91
61	"	29	164.8	82.3	49.94	19.8	14.0	70.71	13.5	15.77	95.7	11.9	19.5	7.6	13.3	89.5	68.2	4.8	3.5	72.92
62	"	24	159.8	80.0	50.06	19.6	14.4	73.47	13.3	15.77	98.6	10.8	16.9	6.1	13.1	83.4	77.5	4.6	3.7	80.43
63	"	29	150.0	80.1	51.35	18.8	13.0	69.15	12.95	14.92	95.6	10.7	16.5	5.8	12.8	83.6	77.6	4.9	3.85	78.57
64	"	50	155.2	81.2	52.32	19.2	14.4	75.00	13.7	15.77	101.6	11.3	....	....	13.9	81.3	....	4.8	3.8	79.17
65	"	32	153.6	81.7	53.19	18.2	13.9	70.37	12.7	14.93	97.2	11.2	16.9	5.7	13.2	84.85	78.1	4.4	3.55	80.69
66	"	48	158.4	80.3	50.69	18.9	13.8	73.02	12.85	15.25	96.3	11.7	18.5	6.8	12.6	92.9	68.1	5.1	3.65	71.57
67	"	21	158.8	79.9	50.31	18.4	14.0	76.09	12.8	15.07	94.9	10.5	16.6	6.1	12.6	83.3	75.9	4.5	3.6	80.00
68	"	26	161.2	81.5	50.56	19.5	14.0	71.80	13.3	15.60	90.8	11.2	17.7	6.5	12.9	86.8	72.9	5.1	3.45	67.65
69	"	55	155.7	75.1	48.23	19.4	14.2	73.20	13.25	15.62	100.3	10.9	....	....	13.6	80.15	....	4.7	4.1	87.23
70	"	28	166.2	81.7	49.04	19.2	14.0	72.92	13.2	15.47	93.1	10.6	16.8	6.2	13.4	79.1	79.8	4.4	3.5	79.55
71	"	29	155.9	79.9	51.25	18.2	14.4	79.12	13.0	15.20	97.5	11.7	17.3	5.6	12.9	90.7	74.6	5.4	3.9	72.22
72	"	27	165.3	83.9	50.76	19.1	14.6	76.44	13.3	15.67	94.8	10.8	17.8	6.0	14.0	77.1	78.6	4.3	3.8	88.37
73	"	24	168.8	82.2	48.70	19.6	14.4	73.47	13.15	15.72	93.1	11.0	17.7	6.7	13.0	84.6	73.4	4.8	3.3	68.75
74	"	45	170.5	85.6	50.21	19.2	14.7	70.56	13.1	15.67	91.9	12.1	....	....	13.6	89.0	....	5.1	4.0	78.43
75	"	24	159.7	80.0	50.59	18.4	13.8	75.00	12.7	14.97	93.7	10.8	17.3	6.9	13.1	79.4	75.7	4.0	3.5	87.50
76	"	26	163.4	83.6	51.16	20.1	14.4	71.64	13.05	15.85	97.0	10.4	17.9	7.1	13.8	78.3	77.1	4.8	3.9	81.25
77	"	28	158.7	80.6	50.79	18.6	13.6	73.12	12.65	14.95	94.2	11.6	18.3	6.7	12.5	92.8	68.3	4.8	3.5	72.92
78	"	52	164.5	87.8	53.37	18.6	14.1	75.81	12.3	15.00	91.2	12.2	18.2	6.0	13.7	89.05	75.3	5.2	3.7	71.15
79	"	27	158.5	81.0	51.10	18.4	13.8	75.00	13.45	15.22	96.0	10.7	17.0	6.3	12.6	84.9	74.1	4.2	3.65	86.90
80	"	28	161.3	83.2	51.58	18.1	14.1	77.00	13.0	15.07	93.4	11.5	18.2	6.7	13.2	87.1	72.5	5.3	3.5	66.04

81	M	29	166.4	83.6	50.24	19.0	14.4	75.79	13.45	15.62	93.9	10.7	17.4	6.7	13.5	79.3	77.6	4.8	3.7	77.08
82	"	50	160.4	84.1	49.65	18.6	14.9	80.11	13.8	15.77	93.0	11.6	18.4	6.8	13.7	84.7	74.5	4.9	3.65	74.49
83	"	55	158.9	79.5	50.03	18.6	14.6	78.49	13.0	15.40	96.9	12.0	...	...	13.2	90.9	...	5.1	4.4	86.27
84	"	25	163.6	84.4	51.59	19.0	13.6	71.58	13.05	15.22	93.0	10.9	17.0	...	12.5	87.2	73.5	4.8	3.7	77.08
85	"	40	163.0	83.4	51.17	18.0	14.2	78.89	12.9	15.03	92.2	11.2	17.0	5.8	13.5	83.0	70.4	4.8	3.4	70.83
86	"	50	172.5	84.8	49.16	18.4	14.5	78.80	13.55	15.48	89.7	11.8	18.1	6.3	13.0	90.8	71.8	5.1	3.8	74.51
87	"	35	161.6	82.8	51.24	18.6	13.4	72.04	13.0	15.00	92.8	10.8	16.9	6.1	12.9	83.7	76.3	4.7	4.0	85.11
88	"	50	158.5	79.6	50.22	18.8	14.2	75.53	12.6	15.20	95.9	10.9	17.2	6.3	12.5	87.2	72.7	5.3	3.3	62.26
89	"	55	162.2	79.9	49.26	19.0	13.7	72.11	12.65	15.12	93.2	11.4	...	...	13.4	85.1	...	5.6	4.0	71.43
90	"	29	160.0	82.9	51.81	18.6	14.4	77.42	12.8	15.27	95.4	11.5	18.4	...	13.8	83.3	75.0	4.9	3.65	74.49
91	"	32	164.7	85.1	51.67	19.6	14.2	72.45	13.3	15.70	95.5	10.6	16.5	5.9	13.1	80.9	79.4	4.5	3.65	81.11
92	"	48	161.3	83.9	52.01	18.7	14.4	77.01	12.65	15.25	94.5	11.0	17.7	6.7	13.0	84.6	73.4	5.0	3.8	76.00
93	"	24	158.9	85.9	54.06	19.4	14.7	75.77	13.35	15.82	99.6	11.1	16.8	5.7	13.2	84.1	78.6	4.7	3.7	78.72
94	"	48	159.5	83.9	52.60	18.8	14.3	76.06	13.45	15.52	97.3	12.0	18.6	6.6	13.9	86.3	74.7	5.2	3.65	70.19
95	"	50	158.7	79.6	50.16	18.4	13.9	75.54	12.9	15.07	95.0	10.9	...	...	13.1	83.2	...	4.9	3.4	69.39
96	"	50	167.3	84.2	50.33	19.1	13.4	70.16	13.2	15.23	91.0	10.6	16.9	6.3	12.6	84.1	74.6	4.5	3.9	86.67
97	"	50	166.8	80.2	48.08	18.7	13.8	73.80	12.7	15.07	90.4	11.9	...	...	13.2	90.15	...	5.0	3.0	60.00
98	"	50	163.3	86.2	52.79	18.6	14.4	77.42	13.7	15.57	95.3	11.0	17.2	...	13.4	82.1	77.9	4.9	4.05	82.65
99	"	60	160.7	83.4	51.90	18.1	14.6	80.66	13.05	15.25	94.9	11.5	18.0	6.5	13.1	87.8	72.8	4.8	3.65	76.04
100	"	54	154.5	81.0	52.43	18.5	13.6	73.51	12.5	14.87	96.2	11.8	...	...	13.3	88.7	...	4.7	3.55	75.54
101	"	40	165.9	85.7	51.66	18.5	14.5	78.38	13.4	15.47	93.2	10.5	...	...	13.2	79.55	...	4.0	4.0	85.11
102	"	45	158.3	85.9	54.27	18.5	14.0	75.68	13.05	15.18	95.9	10.7	...	...	13.4	79.85	...	4.5	3.7	82.22
103	"	50	163.4	82.4	50.43	19.2	14.5	75.52	13.45	15.72	96.2	11.7	...	...	13.2	88.6	...	5.0	3.7	74.00
104	"	45	159.5	83.3	52.23	18.9	15.3	80.95	13.85	15.85	99.4	10.9	18.4	6.5	12.9	84.5	73.3	4.7	3.6	76.60
105	"	38	168.2	87.0	51.72	18.8	14.3	76.06	12.8	15.30	91.0	11.0	18.4	...	13.4	88.8	72.8	5.4	3.6	66.67
106	"	27	166.7	86.4	51.83	19.2	13.9	72.40	13.4	15.50	93.0	10.7	17.3	6.6	12.8	83.6	74.0	4.9	3.9	79.59
107	"	30	169.4	87.8	51.83	20.0	14.7	73.50	13.7	16.13	95.2	12.7	19.7	7.0	13.6	93.4	69.0	5.3	4.0	75.47
108	"	27	164.3	84.8	51.90	18.9	13.6	71.96	13.05	15.18	92.4	10.9	17.1	6.2	12.5	87.2	73.1	4.8	3.6	75.00
109	"	25	165.8	87.6	52.83	19.5	14.2	72.82	13.4	15.70	94.7	11.2	17.6	6.4	13.6	82.35	77.3	4.9	3.8	77.55
110	"	50	162.7	84.1	51.69	19.0	14.1	74.21	13.5	15.53	95.5	11.4	17.6	6.2	13.0	87.7	73.9	5.2	3.55	68.27
111	"	55	160.7	81.0	50.40	18.5	14.7	79.46	12.75	15.23	95.3	11.5	18.4	6.9	13.3	86.5	72.3	5.5	3.4	61.82
112	"	33	169.9	83.3	49.03	18.3	13.8	75.41	12.7	14.93	87.8	11.0	16.2	5.2	12.8	85.9	79.0	4.8	3.4	70.83
113	"	29	168.8	85.9	50.89	18.6	14.0	75.27	13.4	15.33	90.8	10.7	17.0	6.3	13.1	81.7	77.1	4.5	3.8	84.44
114	"	50	172.7	88.3	51.13	18.9	15.0	79.37	13.4	15.77	91.3	12.1	19.5	7.4	13.6	89.0	69.7	5.3	3.9	73.58

KHARGA OASIS, MEN: DETAILED MEASUREMENTS (Continued)

Number	Sex	Approximate age	Height	Sitting height	Sitting height per cent of total length	Head: d. ant. post.	D. lateral max.	Cephalic index	Height line bet. aud-meant to bregma	Cephalic module	Cephalic module vs. height	Race: Menton-nasion	Menton-crinion	Height of forehead (nasion-crinion)	Diam. bizygom. max.	Facial Index		Nose: height to nasion	Nose, width, max.	Nasal index
																Anatomic	Physiognomic			
115	M	45	167.3	86.6	51.76	18.8	13.5	71.81	13.4	15.23	91.0	10.7	16.7	6.0	12.6	84.9	75.4	4.7	3.65	77.66
116	"	55	164.0	84.0	51.22	18.7	14.5	77.54	13.1	15.43	94.1	10.8	17.5	6.7	12.7	85.0	72.6	4.4	3.8	86.36
117	"	50	164.8	86.4	52.43	19.4	14.4	74.23	13.0	15.60	94.6	11.6	18.2	6.6	13.4	86.6	73.6	5.1	3.8	74.51
118	"	35	160.0	83.4	52.13	19.4	13.9	77.65	13.8	15.70	98.1	12.0	18.1	6.1	13.4	89.55	74.0	4.4	3.8	86.36
119	"	45	167.5	86.7	48.18	19.0	15.0	78.95	13.6	15.87	94.7	10.6	...	...	13.4	79.1	...	4.7	3.7	78.72
120	"	40	162.9	83.4	51.20	19.1	14.4	75.39	13.25	15.58	95.6	11.8	...	...	13.0	90.8	...	5.0	3.2	64.00
121	"	45	165.8	87.1	52.53	19.8	14.6	73.74	13.4	15.93	96.1	12.0	19.0	7.0	13.4	89.55	70.5	5.1	3.8	74.51
122	"	55	166.9	85.1	50.99	18.9	14.5	76.72	13.25	15.55	93.2	11.2	16.7	5.5	13.6	82.35	81.4	4.6	3.65	79.34
123	"	28	164.8	86.2	52.31	19.2	14.0	72.92	13.55	15.58	94.5	11.0	17.2	6.2	13.4	82.1	77.9	4.3	3.4	79.07
124	"	30	163.5	82.0	50.15	19.2	13.1	68.23	12.55	14.95	91.4	11.5	17.4	5.9	12.6	91.3	72.4	4.9	3.3	67.35
125	"	55	161.9	84.0	51.88	18.9	14.3	75.66	12.95	15.38	95.0	10.5	16.1	5.6	13.0	80.8	80.7	4.6	3.5	76.09
126	"	27	161.8	81.1	50.12	18.6	14.1	75.81	12.85	15.18	93.8	10.7	17.2	6.5	12.4	86.3	72.1	4.4	3.6	81.82
127	"	55	155.7	78.6	50.48	19.3	14.6	75.65	13.5	15.80	101.5	11.5	...	...	13.7	83.9	...	5.1	3.7	72.55
128	"	24	168.0	86.5	51.49	18.8	14.2	75.53	13.0	15.33	91.3	11.6	18.1	6.5	12.5	92.8	69.1	5.1	3.6	70.59
129	"	55	167.6	85.2	50.83	19.2	14.8	77.08	13.4	15.80	94.3	10.9	17.9	7.0	13.7	79.6	76.5	4.9	3.95	80.61
130	"	45	158.9	81.2	51.10	19.0	14.4	76.79	13.2	15.53	97.7	11.5	...	...	13.1	87.8	...	5.2	3.25	62.50
131	"	55	152.3	80.3	52.72	18.9	14.4	76.70	12.9	15.40	101.1	11.6	...	...	12.9	89.9	...	5.0	3.8	76.00
132	"	40	164.1	83.8	51.06	18.3	14.2	77.60	12.65	15.05	91.7	11.2	...	...	13.3	84.2	...	4.3	3.9	90.70
133	"	45	165.5	87.8	53.05	19.2	14.8	77.08	13.35	15.78	95.3	12.0	...	...	13.8	87.0	...	4.8	3.6	75.00
134	"	40	170.7	89.5	52.43	19.4	15.0	77.32	13.0	15.77	92.4	11.8	18.6	6.8	13.7	86.1	73.7	4.9	3.7	75.51
135	"	33	171.1	88.5	51.72	18.8	14.4	76.60	13.8	15.67	91.6	11.3	18.3	7.0	13.6	83.1	74.3	5.1	3.9	76.47
136	"	24	167.3	86.4	51.64	18.3	14.3	78.14	13.35	15.32	91.6	11.4	17.2	5.8	12.9	88.4	75.0	4.8	3.55	73.96
137	"	30	160.3	86.5	51.00	18.8	14.3	76.06	13.55	15.55	91.8	11.6	18.2	6.6	13.2	87.9	72.5	5.0	4.0	80.00
138	"	45	150.6	79.8	59.99	18.5	13.6	75.35	13.9	15.33	101.8	11.4	17.6	6.2	12.6	90.5	71.6	5.1	3.8	74.51

139	M	30	161.5	80.9	50.00	19.0	14.1	74.21	12.7	15.27	94.5	10.6	16.8	6.2	12.9	82.2	76.8	4.4	3.95	88.78
140	"	35	166.0	84.1	50.66	19.2	13.9	72.40	13.2	15.43	93.0	11.1	17.6	6.7	13.3	83.5	75.6	4.5	4.1	91.11
141	"	50	168.0	84.3	50.18	18.2	12.8	70.33	12.30	14.43	85.9	10.7	16.8	6.1	12.1	88.4	72.0	4.8	3.35	69.79
142	"	45	165.6	83.6	50.48	19.3	14.4	74.61	13.15	15.62	94.3	13.9	...	...	14.0	90.3	...	5.7	3.5	61.40
143	"	40	156.3	80.4	51.44	18.2	14.0	76.92	13.0	15.07	90.4	9.9	16.3	6.4	12.6	78.6	77.3	4.4	3.5	79.55
144	"	40	166.1	88.5	53.28	18.4	14.1	76.63	13.1	15.20	91.5	11.4	18.2	6.8	13.4	85.1	73.6	5.1	3.7	72.55
145	"	40	167.1	88.6	53.02	19.0	14.2	74.74	13.3	15.50	92.8	11.6	18.0	6.4	12.8	90.6	71.1	5.0	3.75	75.00
146	"	35	167.2	81.3	48.62	19.1	13.6	71.20	13.35	15.25	91.2	11.1	17.7	6.6	12.6	88.1	71.2	4.9	3.8	77.55
147	"	35	168.4	86.5	51.37	18.7	14.4	77.01	13.25	15.45	91.7	11.0	17.8	6.8	12.8	85.9	71.9	4.9	3.75	76.53
148	"	55	167.5	79.2	47.28	18.6	14.0	75.27	13.35	15.32	91.5	10.6	16.6	6.0	13.2	80.3	79.5	4.6	4.05	88.04
149	"	24	167.3	84.6	50.57	18.7	14.0	74.37	13.55	15.18	90.7	10.9	16.0	5.1	13.3	81.95	83.1	4.9	3.7	75.51
150	"	50	174.6	85.8	49.14	18.7	13.7	73.26	13.50	15.30	87.6	11.7	18.4	6.7	12.7	92.1	69.0	5.2	3.45	66.35

KHARGA OASIS, MEN: DETAILED MEASUREMENTS (Continued)

Number	Diam. frontal min.	Diam. bicipital	Mouth, width	Left hand, length	Left hand, width	Hand index	Left foot, length	Left foot, width	Foot index	Left leg, circum. max.	Temperature (sub-lingual)	Pulse	Respiration	Time of the day	Present state of health	Muscular force			Left ear		
																Pressure	Traction		Height	Breadth	
																	R. hand	L. hand			
1	10.8	9.2	5.5	18.6	8.2	44.1	23.9	9.8	41.0	...	98.8	100	17	10.20 a.m.	Throat trouble	28.0	26.0	19.0	7.1	4.3	
2	10.0	10.5	4.7	18.9	9.0	47.6	25.2	9.6	38.1	...	98.7	70	19	10.40 "	+	40.5	41.0	(31.0)	6.2	3.7	
3	10.4	10.1	5.4	18.5	8.9	48.1	25.5	10.7	41.9	...	98.6	92	16	11.05 "	Tongue clean	37.5	33.5	14.0	6.2	3.3	
4	10.4	10.1	5.4	18.4	8.7	47.3	23.9	9.8	41.0	...	99.5	92	22	11.20 "	Tg. whitish at back	31.5	25.5	...	5.7	3.3	
5	10.3	9.7	5.5	20.1	9.0	44.8	26.1	10.7	40.9	...	99.3	70	17	11.50 "	Tg. coated	34.0	29.5	(24.5)	6.6	3.8	
6	10.5	10.5	5.0	18.4	8.9	48.4	23.7	9.6	40.5	...	99.0	69	22	12.10 p.m.	Tg. coated	41.0	40.5	23.0	6.1	3.7	
7	9.8	10.6	5.8	18.9	9.0	47.6	25.2	10.6	42.1	...	99.1	75	15	3.00 "	Tg. sl. whitish	31.5	21.0	18.0	6.1	3.3	
8	10.3	10.6	5.8	18.9	9.5	50.3	26.2	10.3	39.3	...	99.2	73	21	3.45 "	Tg. +	34.0	31.0	25.0	6.45	3.65	
9	10.7	10.2	5.9	20.5	9.8	47.8	28.1	11.2	39.5	...	99.5	75	16	4.10 "	Tg. near +	32.5	28.5	20.5	6.5	3.95	
10	10.5	9.3	5.3	21.5	9.6	44.6	27.2	10.8	39.3	...	99.6	78	18	4.30 "	Tg. clean	37.5	30.0	25.0	5.65	3.75	
11	10.4	10.6	5.0	19.7	8.9	45.2	26.1	10.3	39.4	...	99.9	80	18	4.50 "	Tg. whitish	29.5	28.5	20.0	6.05	4.0	
12	10.3	10.1	5.3	19.7	9.6	48.7	25.7	10.8	42.0	31.5	99.1	71	18	10.20 a.m.	Tg. n. +	40.5	35.5	22.5	6.0	4.0	
13	10.6	9.9	6.0	19.6	9.1	46.4	26.9	10.7	39.7	34.9	99.1	76	18	10.50 "	Tg. sl. wh. fur.	29.5	27.5	21.0	6.5	3.8	
14	10.9	10.5	4.7	19.3	9.0	46.6	25.5	10.5	41.2	33.9	98.5	82	20	11.20 "	Tg. sl. furred	35.0	1	...	6.2	3.7	
15	10.7	9.8	5.1	20.0	8.8	44.0	26.8	10.5	39.2	33.1	99.3	80	15	12.00 m.	Tg. +	35.0	1	19.0	6.35	3.55	
16	10.1	9.7	5.7	19.1	9.4	49.2	25.6	10.3	40.2	32.0	98.7	72	20	3.50 p.m.	+	32.0	29.5	24.0	6.9	4.0	
17	10.2	10.5	3.3	18.8	8.9	47.3	26.7	9.6	40.5	30.7	97.9	78	18	9.40 a.m.	+	(blind)	36.0	33.0	28.0	6.65	3.9
18	10.4	10.8	5.0	18.7	9.3	49.7	26.3	10.9	41.4	32.7	97.9	62	20	12.15 p.m.	Tg. sl. coated	44.0	39.0	32.0	6.2	3.95	
19	10.6	9.9	5.8	19.9	9.2	46.2	25.9	10.4	40.15	33.4	98.2	82	21	12.30 "	Tg. edges yellowish	32.0	26.0	12.0	6.3	3.9	
20	10.0	10.7	5.3	19.0	8.7	45.8	25.8	10.0	38.8	32.0	98.3	78	19	9.40 a.m.	Tg. yellowish	34.0	31.0	25.0	6.0	4.15	
21	10.5	9.3	5.4	20.1	9.5	47.3	26.9	10.4	38.7	33.1	99.2	86	18	10.05 "	Tg. yellowish coated	27.0	25.0	17.0	7.3	3.7	
22	10.0	10.2	5.1	19.7	8.9	45.2	25.9	10.4	40.1	32.0	99.6	72	22	10.25 "	Tg. all coated	36.0	34.0	25.0	7.1	3.9	
23	10.8	10.8	5.8	20.7	9.4	45.4	27.2	10.8	39.3	33.5	98.4	72	20	11.00 "	+	32.0	34.0	16.0	6.4	3.65	
24	10.9	11.1	5.8	19.7	8.5	43.1	26.5	9.6	36.2	33.0	98.3	78	18	11.20 "	+						

25	10.7	10.4	5.6	17.6	8.9	50.6	26.1	10.1	38.7	32.2	99.5	(105)	22	11.45 a.m.	Tg. coated	(thumb injured)	6.0	3.9				
26	10.0	10.2	5.4	17.2	8.1	47.1	23.6	9.3	39.4	(26.2)	99.4	90	20	3.15 p.m.	Tg. yellow coated	13.0	9.0	7.4	3.8			
27	10.5	9.8	5.1	19.5	8.8	45.1	25.5	10.1	39.6	32.3	99.1	72	20	3.35 "	Tg. somewhat yell. coated	34.0	34.0	22.0	6.5	3.75		
28	9.8	10.0	5.4	18.6	8.3	44.4	25.0	9.5	38.0	32.0	98.5	90	14	3.50 "	Tg. somewhat yell. coated	24.0	21.0	16.0	7.2	3.6		
29	9.6	9.6	5.9	18.6	9.2	44.3	26.0	11.2	43.1	34.0	98.8	90	20	11.30 a.m.	Tg. +	28.0	22.0	15.0	6.9	4.4		
30	10.7	11.4	5.9	18.0	9.1	50.6	24.6	10.7	44.2	34.8	98.3	65	14	11.50 "	Tg. +	32.5	27.5	22.0	6.4	3.75		
31	10.0	10.4	5.0	19.6	9.2	48.9	26.3	10.3	39.2	32.0	97.8	60	15	12.15 p.m.	Tg. +	20.5	23.5	21.0	5.9	3.7		
32	10.3	10.8	5.5	18.4	9.0	49.9	24.6	10.1	41.5	31.3	98.8	66	18	4.30 "	Tg. +	35.0	34.0	15.0	5.7	3.5		
33	10.4	10.3	5.7	18.0	8.6	47.8	24.9	10.1	40.6	31.0	98.2	72	17	4.50 "	Tg. +	30.0	26.0	?	6.1	3.9		
34	10.2	10.0	5.0	20.0	8.9	44.5	25.8	9.8	38.0	32.6	97.5	72	16	8.40 a.m.	Tg. +	34.0	32.0	19.0	6.8	4.15		
35	10.2	10.1	5.5	19.3	8.4	43.5	25.7	9.9	38.5	30.3	(subnor. hungry)	9.15	18	9.15	Tg. sl. coated	35.0	37.5	21.0	5.8	3.8		
36	10.4	10.0	5.3	19.2	8.3	43.2	26.7	9.7	36.3	30.7	97.4	81	22	10.40 "	Tg. sl. coated	30.0	31.0	17.5	6.5	3.5		
37	9.4	8.9	5.2	18.1	8.5	47.0	23.9	8.8	36.8	27.6	97.7	66	21	10.55 "	Tg. n. +	26.0	27.0	17.0	5.4	3.5		
38	11.2	10.4	5.6	19.0	9.0	47.4	26.2	9.7	37.0	30.6	97.5	66	21	10.55 "	Tg. somewhat coated	34.0	29.0	26.0	6.0	3.6		
39	10.3	10.7	6.0	18.6	8.0	43.0	24.7	9.0	36.4	29.4	10.30 "	Tg. +	6.7	3.75
40	10.7	10.8	5.4	19.7	9.1	46.2	28.0	9.6	34.3	33.1	98.1	72	17	11.05 "	Tg. n. +	30.0	36.0	25.0	6.6	4.05		
41	10.9	10.2	5.7	20.3	9.4	46.3	27.2	10.4	38.2	35.9	99.1	irregular	78	11.30 "	Tg. n. +	37.0	31.0	25.0	6.3	3.7		
42	10.2	10.5	5.1	18.0	8.7	48.3	24.0	10.0	41.7	32.1	98.3	78	22	12.00 m.	Tg. +	36.0	37.0	24.0	6.1	3.8		
43	10.7	10.0	5.6	19.9	9.0	45.2	25.3	9.9	39.1	32.7	98.5	78	22	12.15 p.m.	Tg. +	45.0	44.0	26.0	6.1	3.7		
44	10.0	10.6	5.5	19.0	8.7	45.8	25.7	10.1	39.3	29.0	98.6	72	14	12.30 "	Tg. +	33.0	30.5	18.0	6.4	3.5		
45	10.1	10.4	4.7	18.6	8.9	47.85	24.8	9.5	38.3	32.1	98.5	66	18	12.50 "	Tg. sl. coated	31.0	28.0	16.0	6.2	3.65		
46	9.7	9.6	5.6	18.9	8.7	46.0	25.1	10.0	39.8	31.3	...	...	...	1.10 "	Not f. well	34.0	31.0	19.0	5.8	3.6
47	9.9	9.8	5.3	19.1	9.1	47.6	24.7	9.6	38.8	31.6	98.7	81	20	1.20 "	Tg. somewhat yell. coated	27.0	27.0	18.5	6.1	3.85		
48	10.9	12.1	6.0	19.9	9.8	49.25	28.4	10.9	38.4	34.4	98.5	60	24	3.00 "	Tg. somewhat yell. coated	38.0	36.0	25.0	6.7	3.95		
49	9.9	9.1	5.7	18.1	8.5	47.0	24.2	9.8	40.5	29.8	99.1	92	16	3.15 "	Tg. sl. yell. coated	28.0	25.0	18.0	6.0	3.7		
50	10.0	10.0	5.3	18.2	8.1	44.5	25.0	9.8	39.2	33.0	99.1	94	19	3.45 "	Tg. yell. coated	28.0	25.0	19.0	6.4	3.55		
51	9.8	11.2	5.2	17.9	8.2	45.8	25.4	9.8	38.6	34.3	99.2	90	22	4.10 "	Yellowish coated Tg.	7.0	3.8
52	10.2	10.9	5.7	19.9	9.3	46.7	26.2	10.1	38.5	34.0	99.2	82	17	11.30 a.m.	Tg. sl. coated	41.0	38.0	25.5	6.4	3.9		
53	10.3	10.5	5.8	18.5	8.5	45.95	24.6	9.6	39.0	29.2	98.4	72	18	11.50 "	Tg. sl. coated	27.0	27.0	21.0	7.1	3.5		
54	9.8	9.5	5.1	19.4	8.9	45.9	25.2	9.7	38.5	32.3	98.9	76	21	12.40 p.m.	Tg. +	41.0	45.0	30.0	6.0	3.7		
55	9.8	11.0	5.9	19.4	9.4	48.45	27.1	10.5	38.7	35.2	98.2	63	16	12.10 "	Tg. yellowish coated	26.0	25.0	21.0	6.6	4.0		
56	10.7	10.7	5.4	20.0	9.1	45.5	26.3	10.4	39.4	34.0	99.3	75	18	12.55 "	Tg. yellowish coated	44.5	38.0	30.5	6.3	3.8		
57	10.2	10.7	4.9	17.6	8.2	46.6	22.7	9.2	40.5	31.7	98.4	74	18	1.10 "	Tg. +	28.5	28.5	16.0	5.9	3.3		

¹ Sore.² Finger crippled.

KHARGA OASIS, MEN: DETAILED MEASUREMENTS (Continued)

Number	Diam. frontal min.	Diam. bifrontal	Mouth, width	Left hand, length	Left hand, width	Hand index	Left foot, length	Left foot, width	Foot index	Left leg, circum. max.	Temperature (sub-lingual)	Pulse.	Respiration	Time of the day	Present state of health	Muscular force				Left ear	
																Pressure	Traction	L. hand	R. hand	Height	Breadth
58	10.0	10.8	5.9	20.2	9.2	45.5	26.9	9.9	36.8	31.1	....	..	..	3.40 p.m.	+	35.0	31.5	24.5	6.5	3.75	
59	9.6	9.6	5.8	18.0	8.4	46.7	25.8	10.1	39.1	29.7	98.0	78	15	3.55 "	+	30.5	26.0	25.0	5.9	3.55	
60	10.1	9.1	4.8	17.9	7.7	43.0	23.2	9.3	40.1	27.3	97.4	72	20	9.45 a.m.	+	30.0	27.0	19.0	5.4	3.45	
61	9.7	10.1	5.2	18.7	9.0	48.1	25.5	10.1	39.6	33.1	96.5	66	14	10.05 "	+	49.0	45.0	37.5	6.5	3.6	
62	10.7	10.9	5.1	18.7	8.15	44.2	25.7	9.6	37.35	29.9	96.2	72	16	10.20 "	+	....	....	....	6.0	3.6	
63	10.2	10.7	5.3	18.3	8.4	45.9	23.5	9.0	38.3	29.1	97.9	77	17	10.35 "	+	26.0	24.0	14.0	6.2	3.65	
64	10.4	11.0	6.0	18.3	8.5	47.2	24.1	10.3	42.7	33.3	97.8	60	14	10.50 "	+	35.5	31.0	19.5	6.6	3.75	
65	10.2	9.4	4.9	18.3	8.6	47.0	20.3	9.5	46.8	31.5	99.2	78	16	11.10 "	Tg. sl. coated	30.0	29.5	16.0	5.7	3.45	
66	10.2	11.2	5.5	18.8	8.8	46.8	24.7	10.2	42.1	30.2	97.8	70	16	11.25 "	+	34.0	34.5	14.0	6.4	3.5	
67	9.8	10.5	3.18	4.8	5	46.2	23.7	10.0	42.15	31.3	98.0	72	18	11.40 "	+	29.0	30.0	17.5	6.0	3.55	
68	10.5	10.5	1.19	6.8	7	44.8	25.0	9.3	37.2	33.0	98.9	84	18	12.05 p.m.	+	36.5	34.0	18.0	6.4	3.7	
69	10.3	9.7	5.9	18.3	8.2	44.8	24.2	9.7	40.1	30.8	97.6	69	16	12.15 "	+	28.0	24.5	....	6.3	3.5	
70	10.8	10.6	5.7	19.6	8.8	44.9	26.8	9.9	37.0	34.0	98.7	84	19	1.45 "	+	34.5	35.0	27.0	6.2	3.9	
71	10.1	10.5	5.6	18.6	8.4	45.2	24.9	9.9	39.8	32.3	98.9	72	20	2.00 "	+	30.5	30.5	21.0	6.35	3.7	
72	10.6	10.5	5.5	19.0	9.1	47.9	26.3	10.5	39.9	33.2	99.1	72	17	2.15 "	Throat sore	31.0	25.0	27.0	6.2	3.75	
73	10.4	10.2	4.8	21.7	8.8	40.55	27.7	10.3	37.6	33.0	99.2	84	24	2.30 "	Tg. sl. coated yell.	34.5	31.0	21.0	6.4	3.8	
74	10.3	10.6	5.6	19.7	9.0	45.7	27.2	10.45	38.4	37.0	98.8	82	18	2.45 "	Tg. clear	42.0	40.0	29.0	6.6	4.15	
75	10.3	10.3	4.9	19.0	9.1	47.9	26.2	10.0	38.2	33.9	99.4	78	20	3.00 "	+	44.0	42.5	24.0	5.7	3.3	
76	10.6	10.5	6.19	7.9	1	46.2	27.6	10.8	39.1	35.0	98.8	72	18	3.05 "	+	28.0	25.0	....	6.5	3.5	
77	9.8	10.0	5.7	18.5	8.7	47.0	24.5	9.2	37.5	32.2	98.9	72	21	3.20 "	+	26.0	27.0	23.0	6.2	3.8	
78	9.4	10.6	5.3	19.5	9.4	48.2	26.0	9.9	38.1	31.4	98.2	90-84	18	4.30 "	Tg. sm. coated	43.0	36.0	30.5	5.6	3.6	
79	9.7	10.5	4.18	3.8	3	45.4	24.1	9.1	37.75	30.3	99.2	74	20	5.00 "	Tg. sm. coated	32.5	30.0	20.5	5.9	3.6	
80	10.0	10.6	5.1	18.4	9.0	48.9	24.6	10.6	43.9	31.0	97.2	73	18	5.15 "	+	41.0	34.0	24.5	6.3	3.55	
81	10.4	11.1	5.5	19.6	8.8	44.9	26.9	10.6	39.4	33.6	96.8	64	14	10.30 a.m.	+	35.0	37.0	25.0	6.3	3.8	

82	10.6	10.3	5.4	20.4	9.3	45.6	26.2	10.0	38.2	31.6	98.9	84	19	10.45 a.m.	Tg. sl. coated	33.0	32.0	27.0	6.2	3-7
83	10.1	11.8	5.7	18.3	9.1	49.7	25.5	9.8	38.4	29.9	97.7	60	15	11.15 "	Tg. clean	20.5	26.5	33.0	6.2	3-5
84	10.0	10.4	5.3	19.4	8.5	43.8	25.8	10.1	39.1	32.8	99.1	78	19	11.30 "	+	37.0	40.0	23.0	6.0	3-7.5
85	10.1	10.8	5.6	19.4	8.8	45.4	26.1	10.3	39.4	31.7	98.9	78	23	11.45 "	+	35.0	35.0	20.0	6.1	3-7
86	9.0	10.9	5.8	19.4	9.1	46.9	26.2	10.1	38.5	30.7	98.1	70	18	12.05 p.m.	+	27.0	29.0	20.5	6.7	3-7
87	10.8	9.5	5.9	19.3	9.2	47.7	24.6	10.5	43.5	33.5	98.7	54	20	1.20 "	+	42.0	35.0	30.0	6.2	3-7
88	10.5	10.6	5.3	18.6	8.2	44.1	25.4	10.1	39.8	30.2	99.2	70	18	1.35 "	Tg. sl. coated	27.0	31.0	14.0	6.4	3-7
89	10.2	11.1	5.7	20.7	9.3	44.9	26.7	11.0	42.6	34.1	99.3	84	19	1.50 "	Tg. sl. coated	27.0	30.0	21.0	7.3	4-2
90	9.4	10.0	5.3	18.1	9.1	50.3	24.4	10.4	42.6	32.1	99.7	85	24	2.05 "	Not f. well	35.0	33.0	27.0	6.4	3-5.5
91	10.7	10.6	5.5	19.2	9.1	47.4	25.0	9.7	38.8	33.0	97.6	72	18	10.40 a.m.	+	30.0	30.0	20.0	6.1	3-4
92	10.2	10.1	5.4	17.9	8.6	48.0	24.9	9.9	39.8	29.7	97.3	62	15	11.40 "	+	28.0	26.0	16.5	6.0	3-5
93	10.3	10.3	5.0	17.9	8.5	47.5	22.7	9.8	43.2	33.5	99.3	66	19	11.55 "	Tg. sm. coated	38.0	31.0	23.0	6.4	3-7.5
94	10.7	10.7	5.8	18.9	8.8	46.6	26.9	10.1	37.5	30.5	98.7	69	18	12.55 "	+	28.0	26.0	20.0	6.7	3-8.5
95	9.9	9.5	5.3	18.6	8.4	45.2	25.0	8.8	35.2	30.0	98.5	76	16	2.00 "	Tg. sm. coated	33.0	20.5	20.0	6.5	3-8
96	10.0	10.5	5.4	19.2	8.6	44.8	26.3	10.2	38.7	31.0	99.5	71	24	2.15 "	+	34.0	32.0	16.5	6.7	3-8
97	10.3	10.7	5.2	18.9	8.6	45.5	25.5	9.4	36.9	30.0	98.5	70	19	2.30 "	Tg. yellow coated	28.0	25.0	15.5	6.7	3-8
98	10.2	10.5	5.1	18.9	8.7	46.0	24.0	9.5	39.6	31.0	98.8	78	18	2.45 "	Not f. well	28.0	....	13.0	6.1	3-4
99	10.6	9.8	5.7	18.7	8.5	45.45	24.8	9.5	38.3	29.0	98.8	78	17	3.00 "	+	34.0	....	16.0	6.5	3-5
100	10.1	9.7	5.1	17.6	7.8	44.3	23.3	8.8	37.8	31.0	98.8	78	17	3.15 "	+	25.0	25.0	15.0	5.7	3-4
101	....	....	....	20.1	9.1	45.3	25.4	9.9	39.0	34.7	....	....	....	....	+	33.5	34.0	26.0	5.8	3-5
102	....	....	....	18.2	8.5	46.7	24.2	9.8	40.5	30.8	....	....	....	....	+	26.0	25.0	16.0	6.1	3-3
103	....	....	....	19.4	8.3	42.8	25.3	9.2	36.4	31.0	....	....	....	....	+	30.0	32.0	14.0	6.6	3-7.5
104	....	....	....	....	....	....	....	....	....	....	....	....	....	....	+	31.0	27.0	25.5	6.4	3-6
105	....	....	....	....	....	....	....	....	....	20.0	....	....	....	....	+	34.5	30.0	26.0	6.5	4-0
106	....	....	....	....	....	....	....	....	....	32.7	....	....	....	....	+	42.0	37.0	22.0	....	....
107	....	....	....	....	....	....	....	....	....	31.9	....	....	....	....	+	37.0	29.0	31.0	....	....
108	....	....	....	....	....	....	....	....	....	32.5	....	....	....	....	+	44.5	41.5	35.0	....	....
109	....	....	....	....	....	....	....	....	....	33.1	....	....	....	....	+	40.0	35.0	33.0	....	....
110	....	....	....	....	....	....	....	....	....	34.5	....	....	....	....	+	27.5	26.0	29.0	....	....
111	....	....	....	....	....	....	....	....	....	32.0	....	....	....	....	Sm. feeble	....	....	....	....	....
112	....	....	....	....	....	....	....	....	....	....	....	....	....	....	+	38.0	36.0	32.0	....	....
113	....	....	....	....	....	....	....	....	....	31.0	....	....	....	....	+	33.0	30.0	26.0	....	....
114	....	....	....	....	....	....	....	....	....	31.0	....	....	....	....	+	27.0	26.0	17.0	....	....
115	....	....	....	....	....	....	....	....	....	31.5	....	....	....	....	Not strong	....	....	....	....	....

KHARGA OASIS, MEN: DETAILED MEASUREMENTS (Continued)

Number	Diam. frontal min.	Diam. bigonial	Mouth, width	Left hand, length	Left hand, width	Hand index	Left foot, length	Left foot, width	Foot index	Left leg, circum. max.	Temperature (sub-lingual)	Pulse	Respiration	Time of the day	Present state of health	Muscular force			Left ear		
																Pressure		Traction	Height	Breadth	
																R. hand	L. hand				
116	29.9	.....	.....	.....	.....	Not up to full strength +++++	.....	.....	.....	.....
117	31.2	.....	.....	.....	.....		36.0	34.5	30.0	.....	.....
118	31.1	.....	.....	.....	.....		40.0	39.0	27.0	.....	.....
119	32.2	.....	.....	.....	.....		41.0	30.0	23.0	.....	.....
120	30.7	.....	.....	.....	.....		39.0	35.0	25.0	.....	.....
121	34.2	.....	.....	.....	.....		46.0	44.0	30.0	.....	.....
122	31.8	.....	.....	.....	.....		42.0	41.0	26.0	.....	.....
123	31.8	.....	.....	.....	.....		44.0	39.0	27.0	.....	.....
124	30.7
125	31.0		28.5	31.0	23.0
126		33.5	35.0	18.5
127		27.0	24.0	10.0
128		33.0	29.0	15.5
129
130
131
132	
133	
134	
135	
136	+	46.0	36.0	33.0	.....	.....
137	
138	
139	

[illegible]

The following series of plates illustrate the Kharga natives from the nearly adult to the aged, showing the principal physiognomic variations.



KHARGA OASIS NATIVES: SHEK MOUSTAFA HANADI, THE OMDEH OF THE OASIS (HIS ANCESTORS CAME, MANY GENERATIONS AGO, FROM ARABIA)



KHARGA OASIS NATIVES: YOUNG MAN



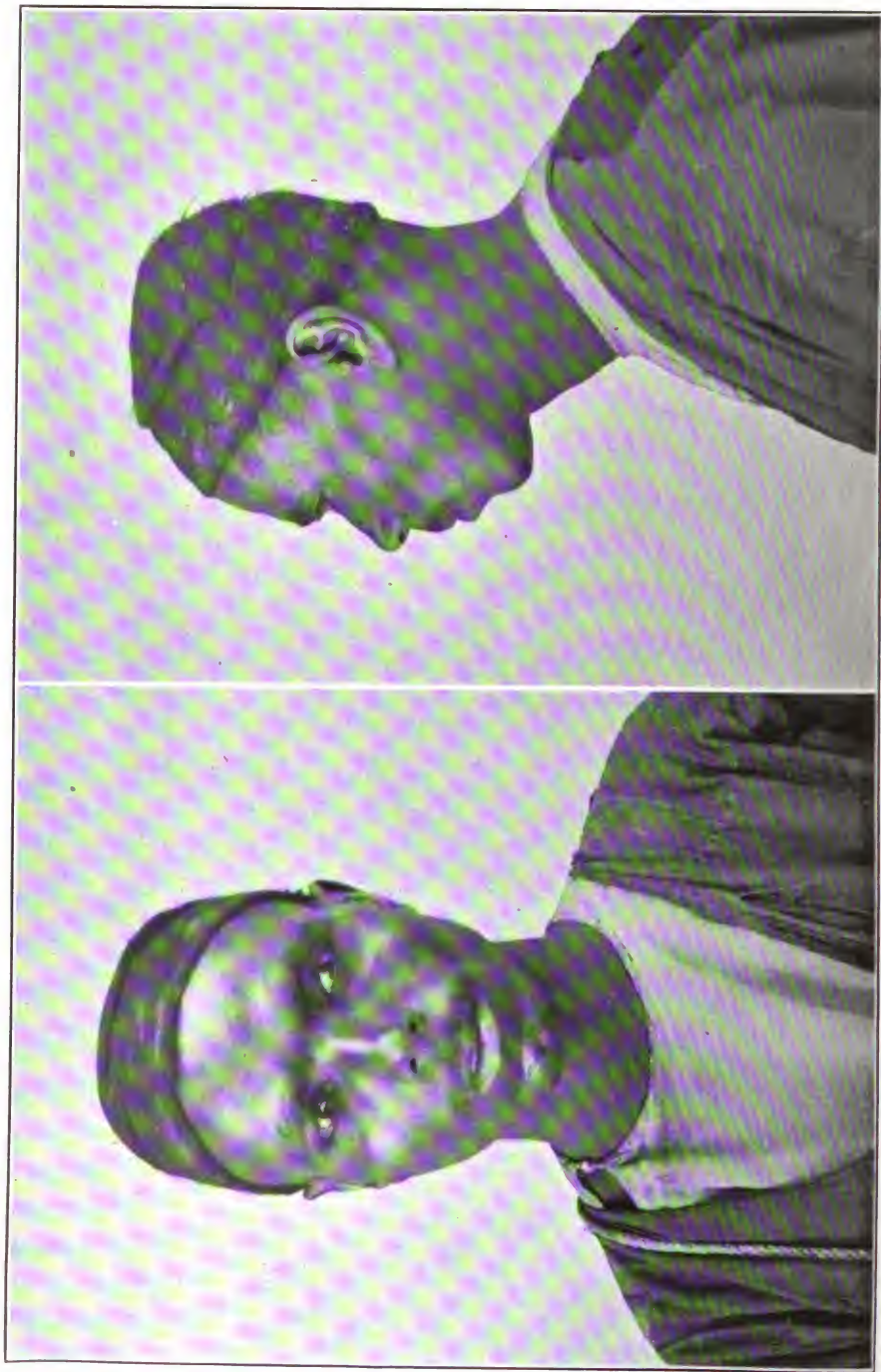
KHARGA OASIS NATIVES: YOUNG MEN; APPROACH NUBIAN TYPES IN PHYSIOGNOMY



KHARGA OASIS NATIVES: YOUNG MEN; ONE ON RIGHT QUITE BLIND



KHARGA OASIS NATIVES: YOUNG MEN, UNUSUALLY DARK, POSSIBLY SLIGHT NEGRO ADMIXTURE



KHARGA OASIS NATIVES: YOUNG FARMER ORDINARY TYPE OF PHYSIOGNOMY



KHARGA OASIS NATIVES: TWO YOUNG MEN, SHOWING ORDINARY FACIAL FEATURES IN OUTLINE



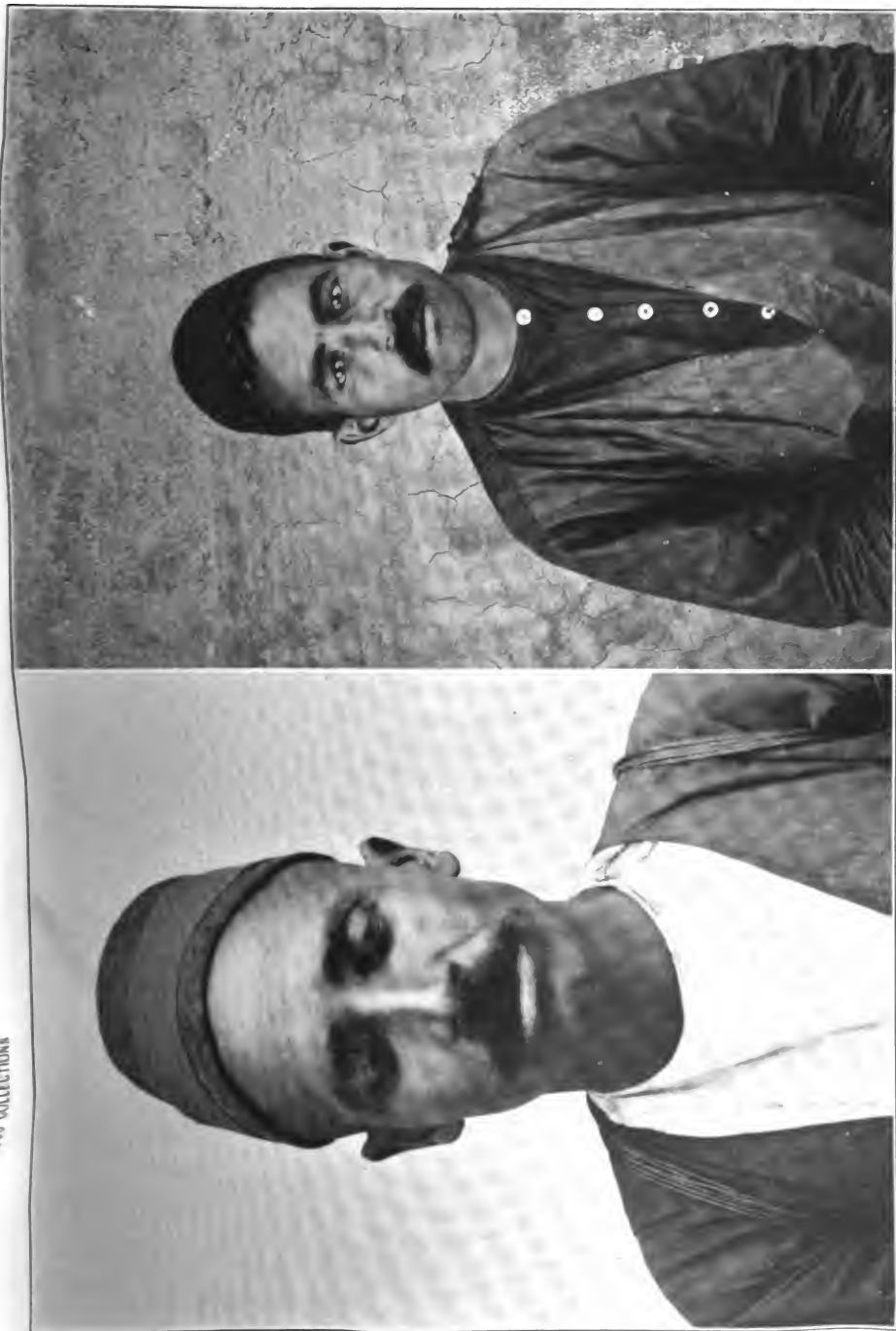
KHARGA OASIS NATIVES: TWO YOUNG MEN



KHARGA OASIS NATIVES: A YOUNG FARMER, TYPICAL OASIS PHYSIOGNOMY



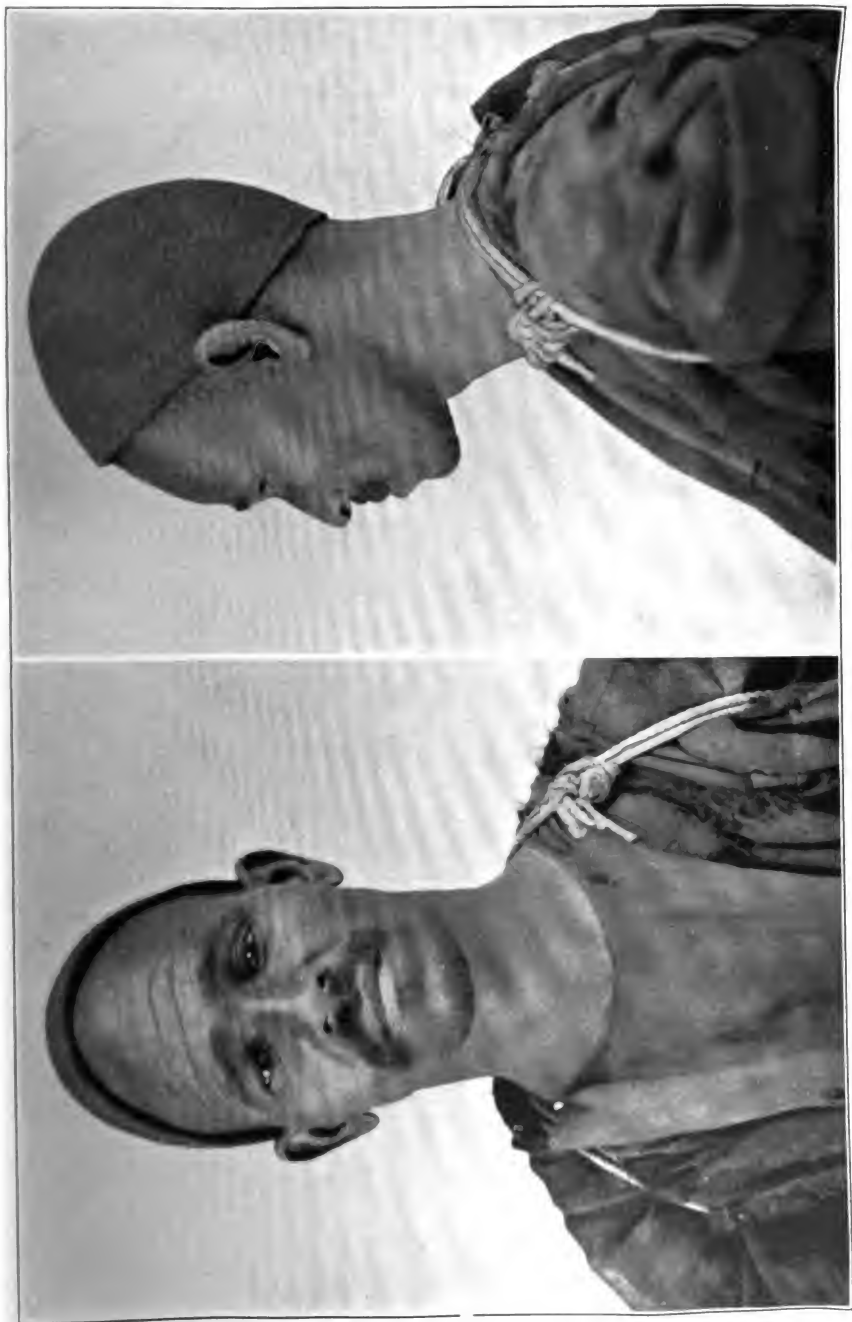
KHARGA OASIS NATIVES: YOUNG FARMER, SOMEWHAT ASYMMETRIC FEATURES



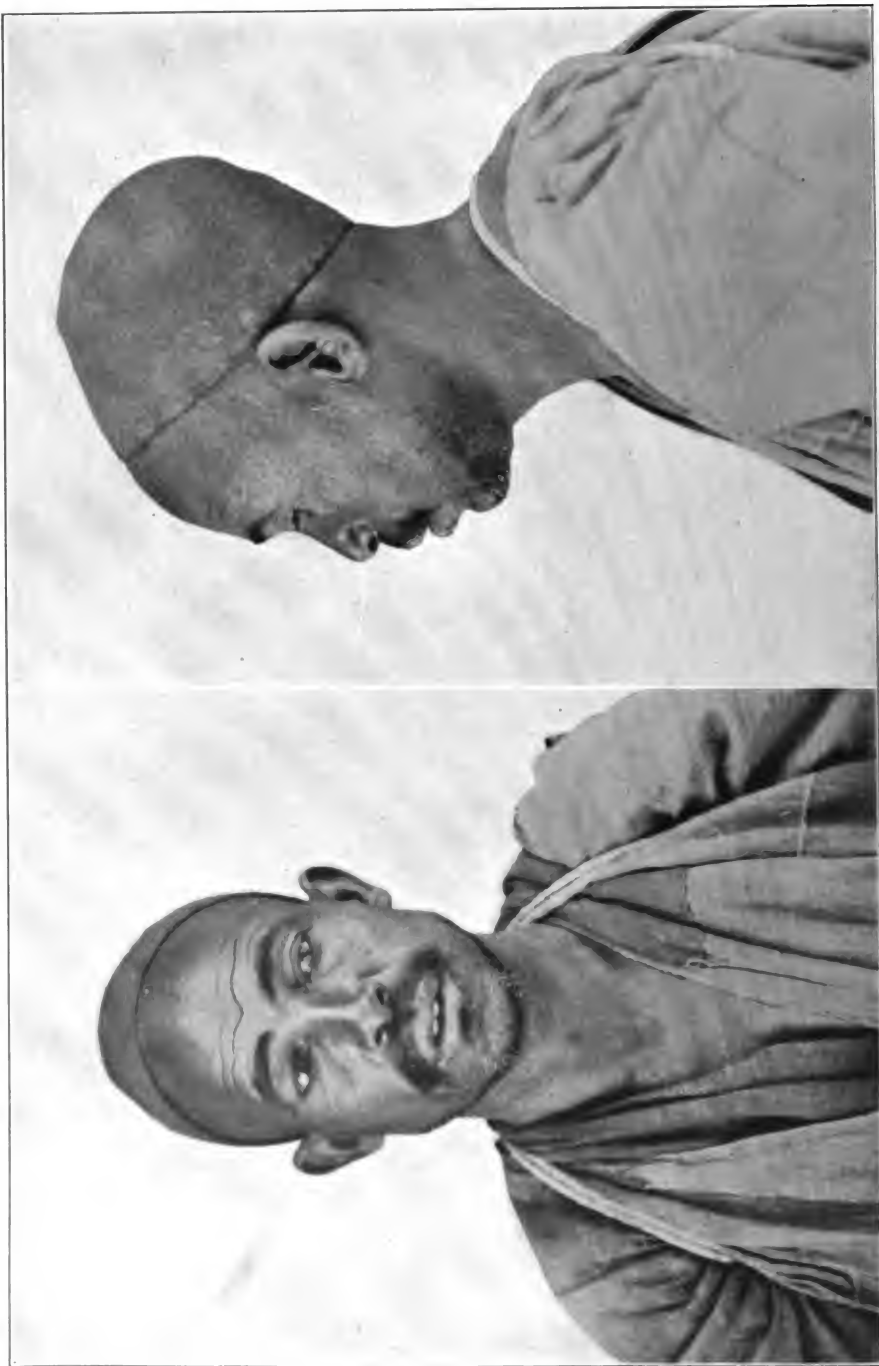
KHARCA OASIS NATIVES: TWO MEN WITH PHYSIONOMY OF MEDITERRANEAN TYPE



KHARGA OASIS NATIVES: A MAN NEAR 40 YEARS OF AGE



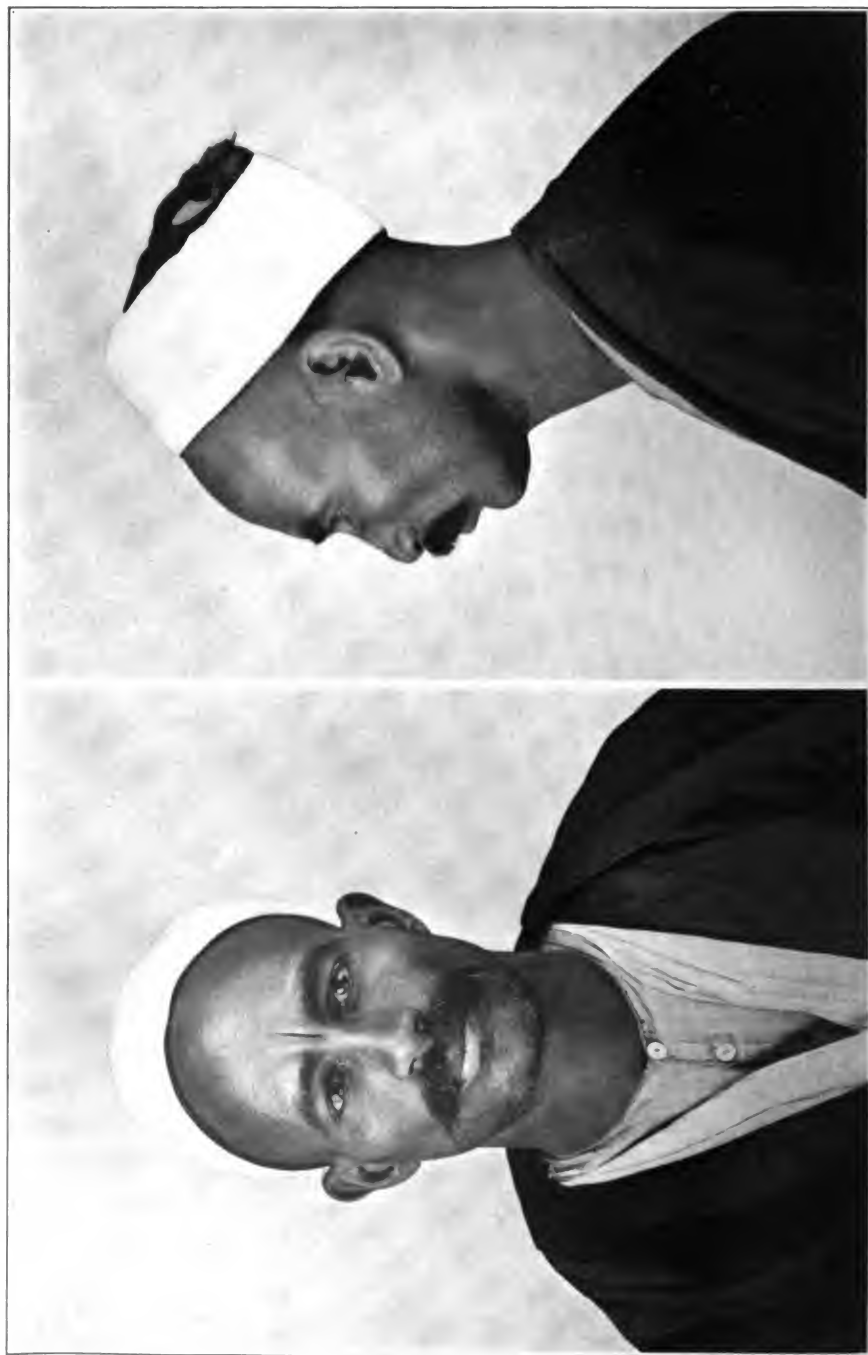
KHARGA OASIS NATIVES: A FARMER, ORDINARY OASIS PHYSIOGNOMY



KHARGA OASIS NATIVES: MAN ABOUT 40, SOMEWHAT SEMITIC TYPE OF FACE



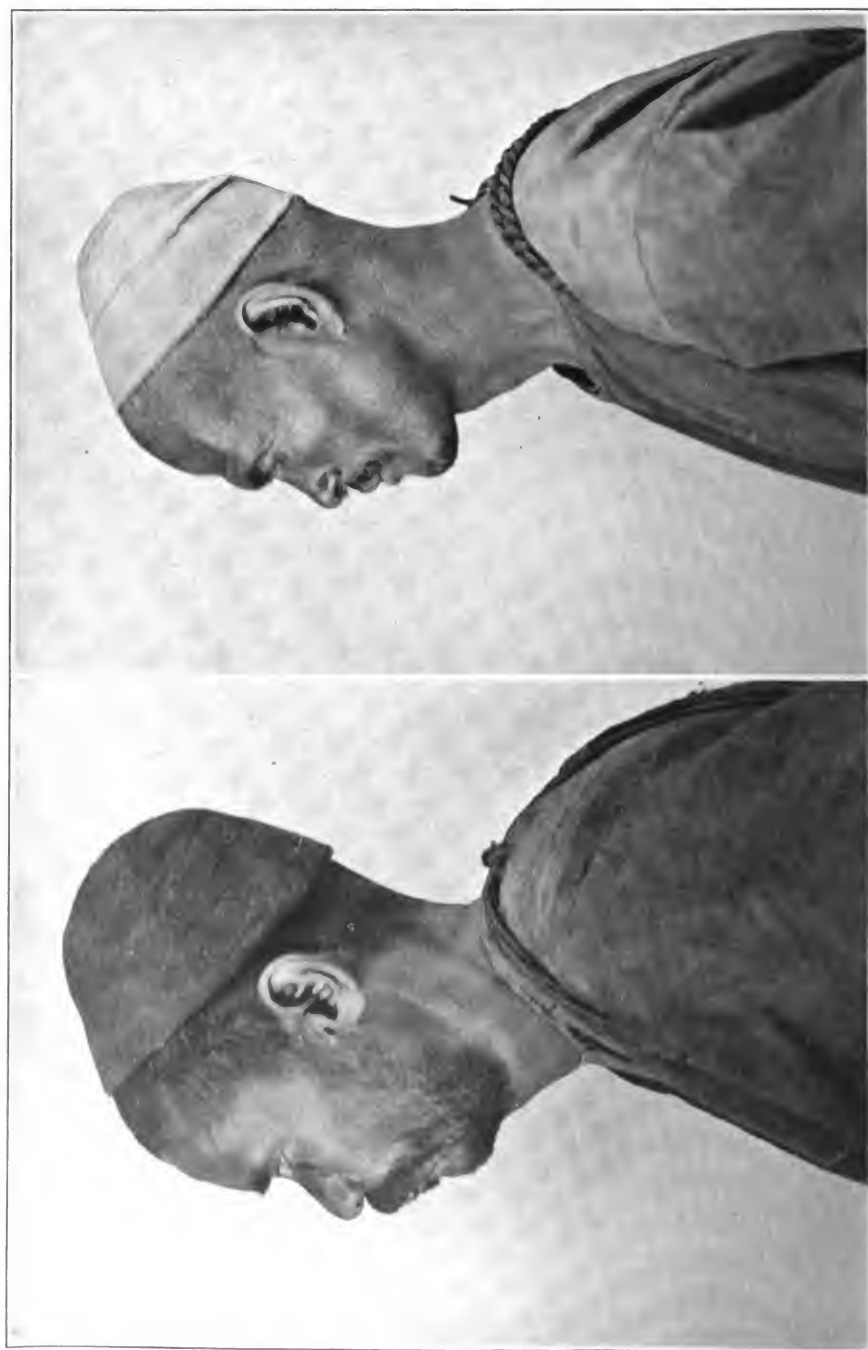
KHARGA OASIS NATIVES: MAN OF STRONG PHYSIQUE, ORDINARY KHARGA PHYSIOGNOMY



KHARGA OASIS NATIVES: ONE OF THE BETTER CONDITIONED



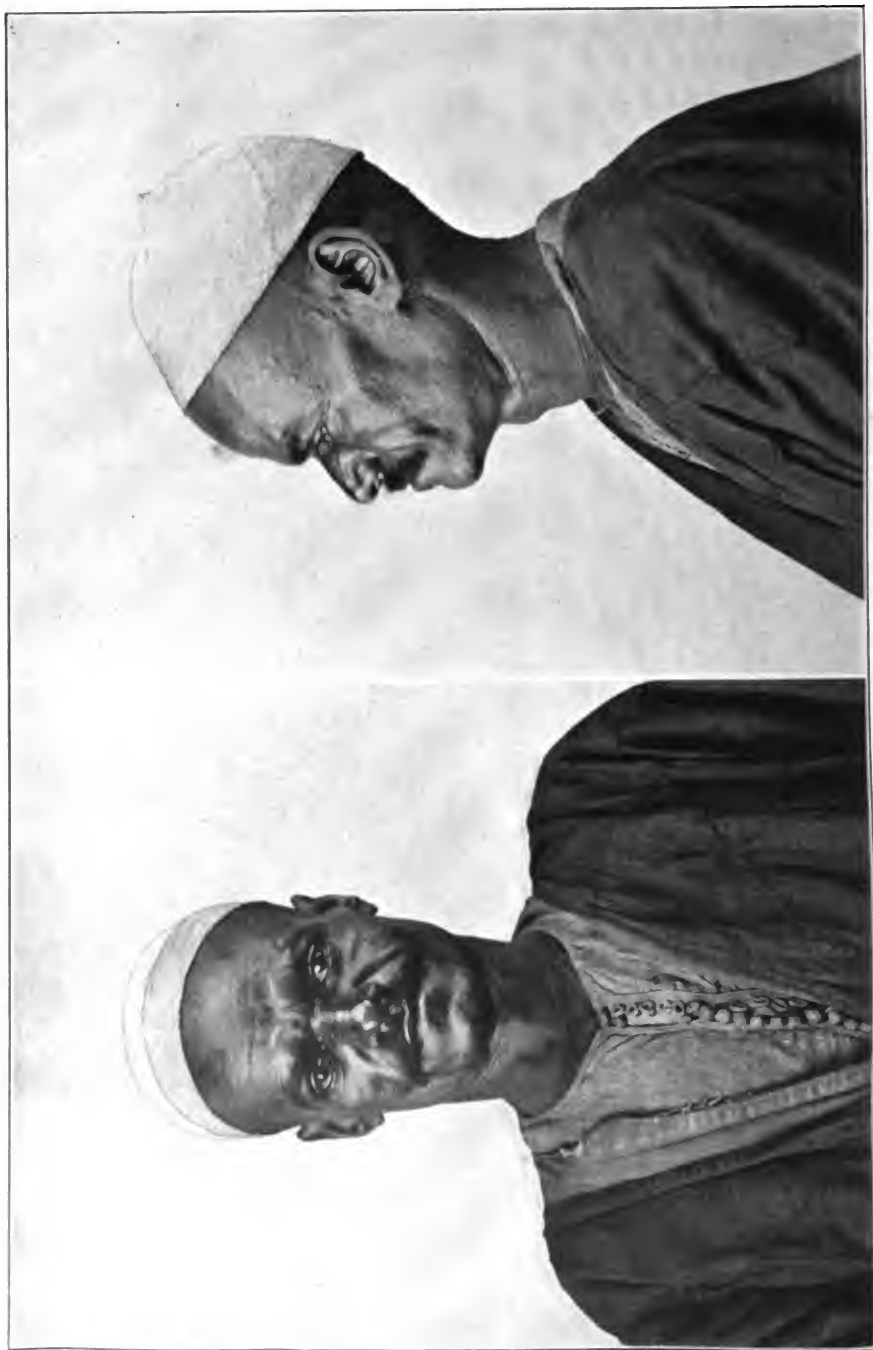
KHARGA OASIS NATIVES: TWO FARMERS



KHARGA OASIS NATIVES: TWO AGRICULTURAL NATIVES, SIDE VIEW



KHARGA OASIS NATIVES: MAN ABOUT 45 YEARS OF AGE



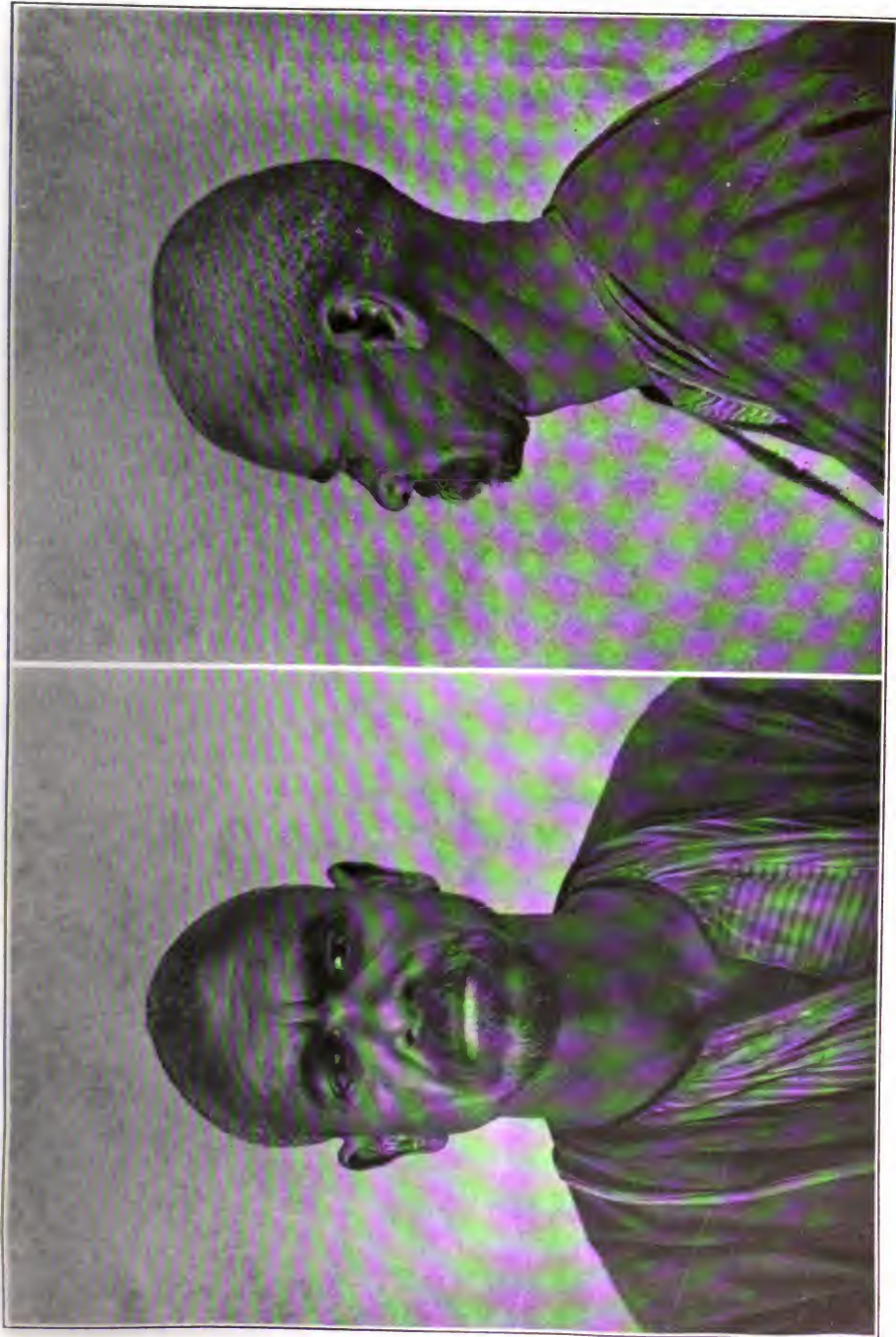
KHARGA OASIS NATIVES: MAN APPROXIMATELY 50 YEARS OF AGE



KHARGA OASIS NATIVES: TWO MIDDLE-AGED MEN



KHARGA OASIS NATIVES: MIDDLE-AGED AGRICULTURAL LABORER



KHARGA OASIS NATIVES: MIDDLE-AGED MAN



KHARGA OASIS NATIVES: MIDDLE-AGED MAN OF SOMEWHAT BETTER CLASS



KHARGA OASIS NATIVES: MIDDLE-AGED FARMER SOMEWHAT SEMITIC PHYSIOGNOMY



KHARGA OASIS NATIVES: A FARMER



KHARGA OASIS NATIVES: MAN ABOUT 55 YEARS OF AGE



KHARGA OASIS NATIVES: A SLIGHTLY AGEING FARMER, TYPICAL KHARGA PHYSIOGNOMY



KHARGA OASIS NATIVES: A SOMEWHAT AGEING MAN, FINE SEMITIC PHYSIOGNOMY



KHARGA OASIS NATIVES: MAN NEAR 60 YEARS OF AGE



KHARGA OASIS NATIVES: AGEING FARMER, TYPICAL KHARGA FEATURES



KHARGA_OASIS_NATIVES: MAN ABOUT 65 YEARS OF AGE



KHARGA OASIS NATIVES: SOMEWHAT AGED MAN (LOSS OF TEETH)



KHARGA OASIS NATIVES: AGED BUT STILL QUITE ROBUST MAN



KHARGA OASIS NATIVES: AGED MAN

SI 1.7:
v. 592

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 2

NEW SPECIES OF FOSSIL SHELLS FROM PANAMA AND COSTA RICA

Collected by D. F. MacDonald



(PUBLICATION 2077)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
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COLLECTED BY D. F. MACDONALD

By WILLIAM HEALEY DALL

After the appointment of Mr. D. F. MacDonald as geologist to the Canal Commission, the collecting of the Tertiary fossils, so abundant in the Zone, was begun with energy. Amongst the material forwarded was a considerable amount of Pleistocene remains, chiefly from near Toro Point, Monkey Hill (Mt. Hope of some authorities), and the swamps about Limon Bay. All of this deposit was elevated but a few feet above the sea. While mostly composed of common Caribbean recent species there is also an interesting admixture of forms now living only on the Pacific Coast, such as *Northia northia* Gray, and *Pecten* (*Plagiocentrum*) *ventricosus* Sowerby. Their presence shows that after the complete separation of the two seas a few of the Pacific species lingered on the Atlantic side nearly to the present epoch. The relative proportion of such species was greater in the Pliocene, while in the Oligocene connection between the two oceans was probably intimate, and many of the species are common to both slopes of the present isthmus.

Subsequent collections by Messrs. Vaughan and MacDonald have not greatly increased the list of those found in the earlier Pleistocene collections.

There is a certain number of species not identifiable with known recent species of the Caribbean waters, yet it would be rash to conclude that they are extinct. Almost nothing has been done to explore the waters in the vicinity of Colon for mollusks and it may well happen that when the dredge is used there most of the species described in this paper will be found in a living state. While the final report with illustrations may be somewhat delayed, it was thought best to describe these apparently new forms from the Pleistocene at the present time.

YOLDIA PERPROTRACTA, new species

Shell thin, elongate, inequilateral, rather bluntly pointed at the posterior, and more rounded at the anterior end; beaks depressed,

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inconspicuous, with a very minute prodissoconch, a very elongate narrow lunule and escutcheon present; the beaks about two-fifths of the total length behind the anterior end. Exterior polished, under a glass showing fine regular concentric striæ with wider interspaces; hinge with about 38 anterior and 48 posterior teeth separated by a small, subtriangular pit for the wholly internal resilium; pallial sinus wide, rather deep, extending nearly to the middle of the valve; the total dorsal margin forms nearly a straight line. Length 29, height at the beaks 8, maximum diameter 5 mm. There is a marked anterior and somewhat smaller posterior gape; the greatest height is at or a little in front of the beaks; the shell is as it were slightly constricted behind them.

The type was collected at station 5850, and is No. 214350, U. S. Nat. Mus.

ARCA (SCAPHARCA) LIMONICA, new species

Shell small, white, rounded below, with a straight hinge-line, carrying about sixteen teeth in an apparently unbroken line; beaks low, mesially impressed in a radial sense, situated a little in front of the middle of the shell; general form rounded quadrate, the area narrow, smooth; surface sculpture of twenty-five squarish, flat-topped, narrow radial riblets with much wider interspaces, the latter crossed by little-elevated, concentric, rather distant lamellæ more numerous and conspicuous toward the beaks. Length 4.0, height 3.5, diameter 2.5 mm.

Station, with the last. Type, U. S. Nat. Mus. 214351.

This little shell has the look of an adult or nearly adult. It is, at all events, apparently not identical with the young of any of the other species obtained from the same beds.

PITARIA SUBARESTA, new species

Shell thin, white, somewhat lozenge-shaped, with the prominent beaks at about the anterior fourth; the basal margin produced, anterior and posterior ends attenuated and roundly pointed; lunule cordate, large, nearly smooth, defined by a feeble incised line; escutcheon none; surface sculptured with rather sharp, narrow, concentric wavelets, with narrower valleys between; posterior end a little compressed and tending to rostration. Hinge of the subgenus, the teeth well developed, the hinge-line short; pallial sinus ascending, pointed above; margin of the valve smooth. Length 28, height at the beaks 23, diameter 15 mm.

Station 5868. Type, U. S. Nat. Mus. 214352.

This species has most resemblance to *P. aresta* Dall, of Porto Rico, but is more trapezoid in form, with a relatively larger lunule, the hinge teeth are of a different shape, as is also the pallial sinus; the shell is more nearly equilateral with a shorter, less arcuate posterior dorsal slope.

CORBULA MACDONALDI, new species

Shell large, nearly equivalve, having much the outline of *Macoma balthica*; anterior end longer, rounded; posterior end shorter; dorsal margin descending to a small angulation at the end of the basal margin; from the beak to this angle extends an obscure ridge behind which the surface is less sharply sculptured. There is no analogous anterior radial ridge. Beaks rather low, closely adjacent, the shell-margins evenly apposed with no gape. Surface finely, somewhat irregularly, concentrically striated; right valve with one strong recurved cardinal tooth in front of a pit under the beak which receives the resilium, the anterior and posterior dorsal margins grooved below to receive the margins of the opposite valve. Interior of the valve smooth, with very distinct muscular and pallial impressions and no pallial sinus; left valve with a spatulate process divided into a ligamentary and resiliary area by a mesial ridge, and behind it a pit into which the cardinal tooth of the right valve enters; dorsal margins of the left valve entire. Length of paired valves 19, height 15, max. diameter 10 mm. A larger valve is 23 mm. in length and 18 in height.

Station 5848. Types, U. S. Nat. Mus. 214353.

This is a very remarkable species not only on account of its unusual size, but because of its regular form and nearly equal valves. It is named in honor of the collector.

SPHENIA WALLACEI, new species

Shell small, myaciform, inequilateral, white; the anterior end shorter, wider, rounded; posterior longer, gradually narrowed and attenuated, terminally roundly truncate; pallial sinus coming nearly to the middle of the shell; outer surface rude, with irregular concentric sculpture; hinge of the usual type in the genus; length 9, height at beak 5, diameter (left valve only) 2 mm.

Station 5849. Type, U. S. Nat. Mus. 214354.

No species, except the very distinct *S. antillensis* of Porto Rico, has been reported from this region. It is named in honor of the former chief engineer of the Canal project.

HAMINEA CANALIS, new species

Shell small, short, cylindrical, subequally rounded at both ends, a shallow pit at the apex, a rather callous pillar with a very minute chink behind it, more noticeable in the young shells; outer lip parallel with the body, but little elevated above the summit of the shell; surface polished, entirely and uniformly covered with sharp spiral striæ with wider interspaces. Some of the specimens show a feeble constriction about the middle. Length 4.0; max. diameter 2.0 mm.

Station 5850. Type, U. S. Nat. Mus. 214355.

This species is notable for its short and cylindrical form and close spiral striation; the latter character varies a little in density in different individuals, but always covers the whole shell. *H. papyrus* A. Adams is perhaps nearest to it, but is proportionately longer.

MARINULA COLONIA, new species

Shell small, of about four whorls, brown, with a darker band at the suture and another at the periphery; the spire short and blunt with an obtuse shoulder to the last whorl; outer lip sharp, simple; body smooth with three very prominent lamellæ, the posterior strongest; pillar curving evenly into the outer lip. Height 5.0; max. diameter 3.0 mm.

Station 5868. Type, U. S. Nat. Mus. 214356.

This genus is reported in the recent state to be confined to the West Coast of Middle and South America, Australia and the Mediterranean.

OLIVELLA MYRMECOÖN, new species

Shell very small, stout, solid, short, of about five whorls; the spire about one-third the whole length, the suture narrowly but deeply channelled. Surface smooth, whitish in the fossils; body with a thin coat of callus, pillar excavated, with a single prominent plait on the outer edge; anterior fasciole short, smooth, the posterior edge abrupt. Length 4.0; max. diameter 2.0 mm.

Station 5849. Types, U. S. Nat. Mus. 214357.

This small but apparently adult species occurs in large numbers. It is notable for its robustly oval form. *O. mutica* Say, is allied to it but is much larger and with a much more profuse deposit of callus. The young of *O. mutica* is proportionately more slender and longer.

CERITHIUM (POTAMIDES?) MILIUM, new species

Shell small, solid, compact, whitish with about eight whorls; nucleus minute, smooth, of about two whorls, followed by reticulately

sculptured whorls, the first with one, the second with two, the third with three, the fourth with five, the fifth with seven, and the last with twelve, equal, revolving threads with subequal or wider interspaces, crossing numerous small, rather obscure axial ridges, and more or less nodulous at the intersections; sutures very distinct but not channelled; upper whorls slightly flattened, last whorl rounded; siphonal fasciole obscure; aperture obovate, outer lip heavily thickened; inner lip with a marked callous deposit; both lips smooth inside; canal short, ample, nearly closed in front. Length of shell, 4.2; of last whorl, 2.5; max. diameter 2.2 mm.

Station 5849. Type, U. S. Nat. Mus. 214358.

Though small, this is a very distinct little species, looking on a casual glance much like a cancellate *Rissoina*. The fossils are of a whitish color.

BITTIUM PANAMENSE, new species

Shell small, slender, dark brown, with deep sutures and six or more very rounded whorls; nucleus absent, subsequent whorls with an exclusively spiral sculpture consisting of very fine, spiral, regularly minutely beaded threads separated by wider interspaces which are filled by two or three still finer, simple, closely adjacent threads; there are seven or eight of the beaded threads on the last whorl. Aperture rounded, the outer lip flaring, hardly thickened; inner lip with a wash of enamel, both smooth, with no posterior sinus; canal short, slightly recurved. Length of shell 7.5, of last whorl 3.50; max. diameter 3.0 mm.

Station 5850. Types, U. S. Nat. Mus. 214359.

There is no known recent species of the region with which this can easily be confused.

TEINOSTOMA (PSEUDOROTELLA) GOETHALSI, new species

Shell small, depressed-turbinate, whitish, of about three whorls, with closely appressed suture, nucleus minute, smooth; last whorl spirally sculptured with two strong grooves at the shoulder, between which are two closely adjacent threads which are sometimes condensed into one prominent thread; marginating the base is another conspicuous groove with a prominent thread behind it; the peripheral space between this thread and the anterior groove at the shoulder is cut by five or six sharp, subequally distant striæ; in front of the marginating basal groove are one or two adjacent spiral threads; the space between the suture and the posterior shoulder groove, the peripheral space, and the base outside the umbilical callus, are

sculptured with fine axial or radiating subequal plications, which are strongest on the base and least prominent on the periphery. The umbilical region is covered by a rather thick, smooth callus. The aperture is very oblique, rounded, the outer lip thin, simple, the labrum with a thick layer of enamel. Max. diameter of shell 2.0; minimum diameter 1.6; height 1.0 mm.

Station 5850. Types, U. S. Nat. Mus. 214360.

There are a number of species related to this one from the same region and from the so-called Pliocene (Gabb) of Costa Rica, but the sculpture of *T. goethalsi* is more complex than in either of the others. It is not uncommon in the marl about Limon Bay, Panama.

CADULUS VAUGHANI, new species

Shell small, white, the girdle or maximum swelling at about the anterior fifth or sixth of the shell, behind which it tapers evenly, with a very slight arcuation to the posterior end. The latter in perfect specimens is circular, the margin divided into four, short, triangular teeth or processes by four indentations opposite one another, of which the lateral notches are most conspicuous. The intervening projections are frequently broken or worn away and then the aperture like the anterior aperture appears simple and circular. The latter is slightly oblique with the margin on the concave side more produced. The surface is polished as usual in the genus. Length 6, diameter at girdle 1.0, at anterior end 0.8, at posterior end 0.4 mm.

Station 5850. Types, U. S. Nat. Mus. 214361.

This is perhaps nearest to *C. dentalinus* of Guppy, but has the girdle differently situated and is less attenuated. It occurs in large numbers in the mud of the Pleistocene stratum.

The geological position of the following species is less definitely fixed and they may probably prove to be older than the preceding forms.

EPITONIUM (STHENORYTIS) TOROËNSE, new species

Shell turbate of somewhat less than five rapidly enlarging whorls; not umbilicate, the suture impressed, the whorls rounded, crossed by nine to thirteen heavy, backwardly appressed, broad varices, which show a tendency to coalesce with one another; the average number in fourteen specimens is ten, and at the shoulder when in perfect condition each is produced into a short but acute spinose process; on the base the varices merge into one another toward the axis of the shell where they form a solid mass; the

aperture is almost or quite circular. Height 30.0; max. diameter of base 21.0; min. diameter of same 17.0; aperture 9.0 mm.

Station 6037, Toro Point, 35 to 50 ft. above the sea. Types, U. S. Nat. Mus. 214340.

This species is most nearly allied to *E. (S.) nobile* Fischer and Bernardi, now recent in the deep water of the Greater Antilles. The recent species has higher and less solid varices and the interspaces are spirally, obsoletely striated, while *E. toroëns* is destitute of any spiral sculpture.

With this species was found a fragment of what is perhaps a distinct species, with more numerous varices which rise vertically from the surface instead of being backwardly appressed. This has a diameter of some 45 mm. and a more oval aperture with a diameter vertically measured of 15 mm. Until better material is obtained this might stand as *E. toroëns* var. *insigne*. Type, U. S. Nat. Mus. 214346.

MARGINELLA MACDONALDI, new species

Shell large, solid, polished, of about four whorls, the spire, which is more or less covered with callus, rising only some 2.5 mm. above the outer lip, and the maximum diameter of the shell is situated only about 10 mm. in front of the summit. The aperture is nearly as long as the shell and in adults deposits a mass of callus on the two lips which recalls that of the base of *Cypræa*; the aperture is narrow behind but flares at the posterior sinus, above and around which on the back of the shell is a special mass of callus. There are several species of the region which possess this peculiarity, a recent one being *M. cincta* Kiener. The outer lip is heavily loaded with enamel, is flattened on its basal surface and grooved behind outside. The labrum has a thinner but also flattened layer of callus and a small ridge of it near to and parallel with the aperture. The pillar has four strong plaits graduated in their interspaces, and most adjacent anteriorly. The canal is wide but shallow. Length of shell 28; max. diameter of base 15; vertical diameter 11 mm.

Station 5882 i, Costa Rica, MacDonald. Types, U. S. Nat. Mus. 214348.

This fine species is very numerous in and characteristic of late Tertiary beds in eastern Costa Rica, of which the age is not yet positively determined.

VOLUTA ALFAROI, new species

Shell about the size of *V. musica*, smooth except for about a dozen rather obscure rounded ribs, most prominent at the shoulder and on the spire. Aperture with the outer lip smooth inside, the inner lip with five major and six or more alternate minor plaits; whorls five exclusive of the nucleus which is minute, smooth, and of about two whorls only slightly more swollen than the succeeding whorl. Near the canal are 7-10 feeble spiral threads with wide interspaces; the canal is deep and the end of the pillar projects in a sharp point beyond it. Length of shell 51, max. diameter 27 mm. Diameter of nucleus 2 mm.

Station 5882 i, Costa Rica, MacDonald. Type, U. S. Nat. Mus. 214347.

This species, probably a precursor of *V. musica*, is instantly distinguishable by the different character of its nucleus. From young specimens of *V. virescens* it is known by its rounder form and the absence of the conspicuous spiral sculpture of *V. virescens*. It is an abundant and characteristic species of the same horizon as the preceding. It is named in honor of Don Anastasio Alfaro, Director of the National Museum of Costa Rica at San José.

TURBO PITTIERI, new species

Shell small, smooth, with five or more whorls, the nucleus lost, the subsequent whorls slightly flattened and the suture smoothly appressed; coloration distinctly retained and consisting of spiral bands of red of varying width on a yellowish ground, the bands articulated or interrupted by small loops of lighter color, exactly as in some banded forms of *Turbo petholatus* L.; aperture defective but obviously similar to that of *T. petholatus* except that the pillar lip is elevated and rounded with a narrow arcuate umbilical chink behind it. The operculum was not obtained. Height 19; max. diameter of base 18; min. diameter 14; height of aperture 11; of last whorl 16 mm.

Station: Colline en démolition, Limon, Costa Rica, Prof. H. Pittier. Type, U. S. Nat. Mus. 214349.

The remarkable point about this species is that the group to which it belongs is not represented on either species coast of the Americas but is distinctly oriental. It is one of an interesting collection obtained in the vicinity of Limon by Prof. Pittier, some years ago, and presented by him to the National Museum. The species is named in his honor.

ARCA (NOËTIA) MACDONALDI, new species.

Shell rather large when fully grown, but mostly represented by half grown specimens, elevated, subtriangular, with very prominent prosocœlous beaks, the anterior end obliquely truncate; posterior end rounded bluntly, anterior end extended into a point near the base. The part of the shell posterior to the truncation sculptured with about twenty-five broad, flat, similar radial ribs with very narrow, shallow, distally channelled interspaces, crossed by fine, equidistant, wavy, concentric lines; carina of the truncation rounded, truncate area with about fourteen squarish, smaller ribs with narrower interspaces which frequently carry one or two fine radial threads. The beaks are much twisted forward, the ligamentary area is entirely behind them and transversely, closely grooved; in front of the beaks, the valve is deeply impressed forming a sort of cavity not sharply bounded; ligamentary area narrow, inclined at a high angle to the hinge-line; posterior teeth with the last 7-9 angular as in *Yoldia*, succeeded by numerous very closely crowded flat teeth, the series divided under the apex of the beak; anterior series shorter, flat, crowded, numbering 9-15 according to the age of the shell. Interior of the shell smooth with well marked muscular impressions, the lateral and basal margins strongly plicate in harmony with the external sculpture. Valves subequal, the beaks nearly medial. Height 45; basal length 54; length of hinge-line 31; max. diameter 48 mm.

Station 5882 m. Types, U. S. Nat. Mus. 214344.

This is an abundant and characteristic shell of the Costa Rica beds, collected by Pittier and MacDonald. It belongs to the group of *A. trinitaria* Guppy, and several others of the region.

ARCA (SCAPHARCA) PITTIERI, new species

Shell of small size, inflated, oblique, with prominent, slightly prosocœlous beaks and a wide, short, lozenge-shaped, mostly smooth, amphidetic area between them; anterior end attenuated and produced but not sharply truncate, posterior end much shorter and very bluntly rounded; exterior with about twenty-six radial ribs sculptured with squarish nodules, and separated by shallow, slightly narrower interspaces crossed by fine concentric striations. The valves are nearly equal and similarly sculptured, with the beaks nearly at the posterior fourth of the length. Internal margins strongly, radially channelled in harmony with the external ribs; hinge-line straight, the tooth series divided somewhat in front of the beaks with about 22 anterior and 18 posterior, closely adjacent,

slightly wavy, flat teeth. Height 25; length of shell 25; of hinge-line 14; max. diameter 26 mm.

Station 5882 *h*. Types, U. S. Nat. Mus. 214343.

This is one of the most abundant species in the above mentioned beds, but does not appear to reach a large size. It is the precursor of *A. Chemnitzii* Philippi, of the recent fauna.

There are also a number of Pyramidellidæ which have been submitted to Dr. Paul Bartsch for determination.

PECTEN (LYROPECTEN) PITTIERI, new species

Shell large, nearly equivalve, suborbicular, coarsely sculptured; left valve moderately convex, with ten strong rounded ribs, obsolete distally, with shallow rounded interspaces at first narrower, afterward wider than the ribs; submargins wide, subequal, radially sculptured with coarse, somewhat irregular threads, about ten in number, which when perfect have a fine, concentric, imbricate sculpture; similar radial sculpture covers both valves, the threads coarser and more regular on the right valve; of the major ribs on the left valve, five alternating ones bear on their proximal halves six to ten prominent, thin, evenly spaced, vaulted scales, resembling those of *P. imbricatus* Gmelin; similar scales are wanting in the right valve; ears subequal, with about half a dozen radial threads and dense, concentric sculpture; margin of the valve wavy, not sulcate; interior with ten deeply channelled, wide sulci corresponding to the external ribs, the angles of the interspaces emphasized near the valve margin; hinge with a deep subtriangular pit for the resilium, a strong anterior ridge and two marked posterior grooves with a ridge between them. Adductor scar large, with a rather ragged margin. Right valve with eleven stronger ribs, each carrying five or six riblets, with two or three similar riblets in the interspaces; the proximal halves of the ribs are slightly undulated but not scaly; ears subequal, rudely imbricate on the dorsal margin and on the four or five radial threads of the anterior ear; ctenolium with about 16 spines, byssal notch narrow, angular; hinge-line grooved reciprocally to that of the left valve. Height 132; length of shell 152; of hinge-line 82; max. diameter omitting spines 46 mm.

Locality, Moin Hill, near Port Limon, Costa Rica, niveau *a*. H. Pittier, 1899.

Type, U. S. Nat. Mus. 214368.

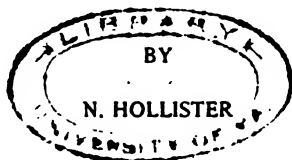
This fine and remarkable species is somewhat intermediate between *Lyropecten* and *Nodipecten*, and when young must have the aspect of a *Chlamys* much like *C. imbricatus*.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 3

DESCRIPTION OF A NEW SUBSPECIES
OF MONKEY FROM BRITISH
EAST AFRICA



(PUBLICATION 2078)

CITY OF WASHINGTON
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The Lord Baltimore Press
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DESCRIPTION OF A NEW SUBSPECIES OF MONKEY FROM BRITISH EAST AFRICA

By N. HOLLISTER

The identification of all the specimens of African monkeys of the genus lately known as *Cercopithecus*,¹ contained in the United States National Museum collection, leaves a single series of specimens from Lake Naivasha, representing the *æthiops* group, which cannot be placed with any previously named form. The description of this new subspecies is herewith presented, as the sixteenth paper dealing with the results of the Smithsonian African Expedition under Col. Theodore Roosevelt.

LASIOPYGA PYGERYTHRA CALLIDA, subsp. nov.

Type from south side of Lake Naivasha, British East Africa. Male adult, skin and skull, U. S. National Museum No. 162843. Collected July 21, 1909, by Dr. Edgar A. Mearns; original No. 6859.

General characters.—Darker colored than *L. p. lutea* or *L. p. johnstoni*, with less yellow in coloration of the back. Rump, hips, legs, and tail darker iron gray; black on hands and feet much more extensive and pure, in adults reaching in an unmixed area beyond wrist and heel. Skull long and narrow.

Color of type.—Face and complete circle around lips pure black; long mustaches of black; brow band white, mixed with black above nose. Whiskers long and full, completely covering ears; buffy-gray, considerably mixed with black. Top and back of head mixed black and buff; nape and upper parts of body to rump mixed wood brown and black, darker along dorsum and paler, more buffy, on sides. Outer sides of arms mixed gray and black; hands pure black to wrist. Rump, hips, and outer sides of legs mixed gray and black, blending with the more tawny color of back and sides; feet black to heel. Tail above dark gray, with strong mixture of black, becoming darker toward end, and with terminal six inches pure black above and the tip black above and below; under side, except near tip, gray with less black than above. Bay spot under tail large and bright, extending

¹ For the use of the name *Lasiopyga* in place of *Cercopithecus*, see Elliot, Bull. Amer. Mus. Nat. Hist., N. Y., Vol. 30, p. 342, December 21, 1911.

from callosities to two inches or more out on under side of tail. Cheeks, throat, and breast white, blending to the more buffy-white under parts of body and limbs.

Skull.—Compared with an adult male skull of *L. p. johnstoni*, the skull of the type is considerably narrower, with smaller orbits; and long, narrow opening of anterior nares, two and one-half times as long as wide. The palatine plate of maxilla is deeply concave, compared to the flat surface of this bone in *johnstoni*.

Measurements of type.—Head and body, 525 millimeters; tail vertebræ, 610; hind foot, 140; ear from crown, 27; weight exactly 10 pounds. Skull: Greatest length, 110.5; condylobasal length, 84; zygomatic breadth, 66; breadth of braincase, 54.5; upper molar-premolar row, 25.4.

Remarks.—In a series of five specimens from the type locality, the color differences exhibited by this race are very constant and conspicuous; and are even more accentuated in the immature skins than in the adults. Unfortunately there is only one adult male skull, and the cranial characters may prove of less value than the color differences, though they seem to be beyond the range of reasonable individual variation.

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**DESCRIPTIONS OF NEW GENERA AND
SPECIES OF MICROLEPIDOPTERA
FROM PANAMA**

WITH ONE PLATE

BY

AUGUST BUSCK



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DESCRIPTIONS OF NEW GENERA AND SPECIES OF MICROLEPIDOPTERA FROM PANAMA¹

By AUGUST BUSCK

(WITH ONE PLATE)

The following descriptions of new forms of Microlepidoptera are published in advance of proposed papers, dealing with the lepidopterous fauna of Panama as a whole, based on material collected by the writer as a member of the Smithsonian Biological Survey of the Panama Canal Zone during the first half of the year 1911.

Two causes were operative in making the present paper merely preliminary: first, the prospect of obtaining additional material through another trip to Panama by the author in 1912 in continuation of the work done in 1911; secondly, the delay in the publication of Lord Walsingham's part of the *Biologia Centrali-Americana*, the completion of which now seems assured within a few months, for it was desirable that the priority of no part of this important work should be interfered with, and in the present paper no species is therefore knowingly described which is already dealt with in the remaining manuscript of the *Biologia*, with which the writer is intimately acquainted.

Family COSMOPTERYGIDÆ

The name Cosmopterygidæ is used here in the same sense as employed by Meyrick, *Trans. Ent. Soc. London*, 1909, p. 17, for the family, defined by the writer in *Proc. Wash. Ent. Soc.*, Vol. 11, p. 93, 1909, and for which I at that time accepted the name Lavernidæ, Walsingham and Durrant.

Mr. Meyrick's name and definition of the family were the first to appear together in print, and as the conception Lavernidæ has already been obscured by the admission of several alien genera in the *Biologia Centrali-Americana*, I adopt the more willingly the name Cosmopterygidæ as the one least likely to cause misunderstanding.

The essential characters of this group are as pointed out (l. c.), the long recurved and pointed labial palpi and the stalked (or coin-

¹ The present paper is the eighth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

cident) veins 7 and 8 of the forewings, both terminating on the costal edge above apex.

I am disposed to regard this family as nearest to and derived from the Gelechiidæ, rather than from the Cœophoridæ as suggested by Mr. Meyrick.

The genera *Pseudastasia* Walsingham, *Scelorthus* Busck, *Embola* Walsingham, *Lithariapteryx* Chambers, *Lamprolophus* Busck, *Heliodines* Stainton, and *Ætole* Chambers, included in the *Lavernidæ* in the *Biologia Centrali-Americana*, must be excluded from the present family.

The genus *Homaledra* Busck is rightly included, but the species described on p. 9 in the above-mentioned work as *H. knabi*, and the type of which is in U. S. Nat. Mus., is on further study found to belong to the genus *Batrachedra* Stainton, which is not Cosmopterygid, but related to *Coleophora* Hübner.

URANGELA, new genus

Labial palpi long, sickle-shaped; second joint with strong, pointed tuft; terminal joint slender, pointed, fully as long as second. Antennæ less than the length of the forewing; basal joint slender, smooth, without pecten. Forewings long and narrow; apex attenuate; with raised scales; 12 veins; 7 and 8 out of 6; 5 out of 6; cell open between 8 and 9. Hindwings very narrow, linear; veins 6 and 7 stalked; cell open; subdorsal vein not branched. Posterior tibiæ hairy.

Closely related to *Cosmopteryx*, which it strongly suggests in general habitus, but differing in the tufted labial palpi; and the degraded venation of the hind wing.

This genus would appear to be allied to or possibly even identical with the Australian genus *Trachydona* Meyrick, but not possessing specimens of this genus, I prefer to err on the safe side, considering the improbability of such identity.

Genotype: *Urangela pygmæa*, new species.

URANGELA PYGMÆA, new species

Tuft on second joint of labial palpi black; terminal joint silvery. Face silvery, strongly iridescent. Antennæ dark brown with a broad white band at apical third. Head and thorax black with strong metallic reflections; two silvery, metallic, longitudinal lines on head and patagiæ. Forewings black with a violet sheen; a strongly iridescent metallic line from base to the middle of the cell; three

tufts of raised metallic scales across the middle of the wing and a broad violet metallic line around entire apical edge. Hindwings dark fuscous. Abdomen and legs metallic black; tips of tarsi light ochreous.

Alar expanse: 8 millimeters.

Habitat: Porto Bello, Panama, March.

Type No. 14529, U. S. Nat. Mus.

MORILOMA, new genus

Labial palpi long, recurved, reaching vertex; both joints slightly roughened in front; terminal joint shorter than second, acute. Head flattened, face strongly retreating. Antennæ $\frac{3}{4}$, basal joint without pecten. Forewings with scale tufts; costa nearly straight, slightly concave; dorsal edge nearly parallel with costal; termen oblique; apex pointed; apical cilia heavy, making the apex appear blunt. 12 veins; 11 from beyond middle of cell; 7 and 8 stalked; 7 to costa; 3, 4, 5 and 6 nearly equidistant; 2 from well before the end of the cell. 1b furcate at base and at tip.¹

Hindwings half as broad as forewings, sickle-shaped with 8 veins; 8 long; 6 and 5 stalked; 7 connate with their stalk; cell open between 4 and 5. Posterior tibiae clothed with rough hairs above.

The genus is nearest *Synalagma* Busck, which differs in having only 11 veins in the forewings and the apex caudate, and *Psacaphora* Herrich-Schaeffer, from which it differs in the flattened head and the rough posterior tibiae.

Blastodacna Wocke differs in the absence of one cubital vein.

Genotype: *Moriloma pardella*, new species.

MORILOMA PARDELLA, new species

Labial palpi light ochreous. Face silvery ochreous. Head and thorax dark greenish brown. Forewings dark greenish brown with a large light ochreous curved streak from the middle of dorsum to the end of the cell, where it forms an arrow-point with a similarly colored short dash on the cell; a light ochreous costal dash just before apex; a tuft of darker raised scales at tornus; terminal edge silvery; apical cilia light brown, dusted with black, extreme tip black with a white line preceding it. Hindwings dark brown;

¹This latter character, effected by the anastomosis of vein 1b, is found also in a few other related genera, *Psacaphora* Herrich-Schaeffer, *Synalagma* Busck, and *Blastodacna* Wocke.

abdomen dark brown above; entire body silvery ochreous on the under side; legs ochreous with broad dark brown bars.

Alar expanse: 7 millimeters.

Habitat: Porto Bello, Panama.

Type No. 14530, U. S. Nat. Mus.

Food plant: *Conostegia* sp. probably *xalapensis* Don.

The larvæ make irregular red blotch-mines on the upper side of the leaves and at maturity cut out the upper and lower epidermis, forming a nearly circular cocoon about 6-7 millimeters in diameter, which falls to the ground. Imagos issued late in March. Several mines may be found in a single leaf.

Family COLEOPHORIDÆ

TOCASTA, new genus

Labial palpi long, recurved, smooth; second joint slightly thickened towards apex; third joint less than half the length of second, acute. Antennæ longer than the forewings, with well developed pecten on the basal joint. Forewings narrow, elongate, pointed; cell very long; 11 veins; vein 2 obsolete (a trace of it barely discernible); all veins separate; 7 to costa; 1b shortly furcate at base. Hindwings half the width of the forewings; 8 veins; 5 and 6 connate; rest separate. Posterior tibiæ hairy.

Most nearly allied to, but lower in the phylogeny than, *Batrachedra* or *Coleophora*.

Genotype: *Tocasta priscella*, new species.

TOCASTA PRISCELLA, new species

Labial palpi blackish fuscous with lighter tip. Antennæ light ochreous with brown annulations. Face and head dark ochreous fuscous. Thorax dark ochreous fuscous. Forewings shining ochreous fuscous, indistinctly dusted with slightly darker scales. Hindwings ochreous fuscous with lighter cilia. Abdomen dark fuscous with lighter anal tuft and with the basal joints velvety ochreous above. Legs ochreous, dusted with fuscous.

Alar expanse: 18 millimeters.

Habitat: Cabima, Panama; May.

Type No. 14562, U. S. Nat. Mus.

Family GELECHIIDÆ

DOLIDIRIA, new genus

Labial palpi long, recurved, reaching beyond vertex; second joint thickened with smoothly appressed scales; terminal joint shorter than second, slender, acute. Tongue well developed, scaled at base. Maxillary palpi rudimentary. Antennæ three-fourths of the wing-length, rather stout, slightly serrated and pubescent; basal joint thickened with heavy scaling. Forewings elongate elliptical; apex evenly rounded; 11 veins; 7 and 8 coincident to costa; rest separate; 2 and 3 from well before the end of the cell; 2 opposite 10. Hindwings broader than the forewings; costa straight; apex blunt; termen slightly sinuate; 8 veins; 6 and 7 stalked; 3 and 4 stalked; 5 cubital. Posterior tibiæ rough-haired above.

The genus is nearest to and a direct development from *Durrantia* Busck, differing only in veins 7 and 8 of the forewings being coincident instead of stalked. The diagnosis of the genus *Durrantia* was purposely widened so as to admit the present form, of which at the time only an undescribed species from Texas was known.

There are however no good grounds to continue this lumping and *Durrantia* should be restricted to the forms agreeing with the type (*piperatella* Zeller) in having 12 veins in the forewings, while the present genus will include those closely allied species with very similar general habitus, which have but 11 veins in the forewings, caused by veins 7 and 8 becoming coincident.

Genotype: *Dolidiria arcanella*, new species.

DOLIDIRIA ARCANELLA, new species

Labial palpi white; second joint shaded externally with ochreous brown. Face and head white. Antennæ light golden fuscous with darker annulations. Thorax white, tinged with ochreous. Forewings ochreous white, with first and second discal spots deep black, edged with ochreous brown, and with sparse single black scales, scattered irregularly over the wing; costal edge golden brown; cilia white. Hindwings silvery white with an ochreous sheen; cilia white. Abdomen and legs light ochreous; tarsal joints dusky.

Alar expanse: 13-14 millimeters.

Habitat: Cabima and Trinidad River, Panama. May.

Type No. 14531, U. S. Nat. Mus.

Very similar in general appearance to the species of the genus *Durrantia* and about the size of *D. acompsa* Walsingham, described

from material collected by the writer in Panama in 1907 and which was also secured in 1911, but *arcanella* can be at once differentiated from this species by its black scaling.

Family. ŒCOPHORIDÆ

GONADA CABIMA, new species

Second joint of labial palpi white; terminal joint tinged with red. Lower part of face reddish white; vertex, head and thorax light reddish brown, antennæ reddish ochreous. Forewings reddish brown, rather lighter towards the terminal edge and strongly suffused with ochreous on basal half of dorsum. First and second discal spots, small, inconspicuous black dots; a similar plical dot on apical third of the fold; cilia brown. Hindwings light reddish ochreous; cilia yellow. Abdomen above reddish brown, each joint with a light ochreous transverse line posteriorly. Entire under side of body silvery white. Legs silvery white; anterior tibiæ with a red longitudinal line in front.

The oral characters and the peculiar wing-form are identical with those of the type of the genus, *falculinella* Busck; the venation differs slightly in the forewings in having the protruding lower part of the cell narrower and veins 4 and 5 short-stalked, but the two species cannot be separated generically; though rather similar also in size, the two species are amply differentiated specifically by color and pattern.

Alar expanse: 23 millimeters.

Habitat: Cabima, Panama, May.

Type No. 14532, U. S. Nat. Mus.

LUPERCALIA, new genus

Labial palpi very long, slender, curved; second joint slightly thickened with smoothly appressed scales; terminal joint as long as second joint, slim, acute. Antennæ longer than the forewings, finely ciliated (1), and towards the tip serrated; basal joint with well developed pecten. Forewings long and narrow; costa and dorsum straight and nearly parallel; termen oblique; apex bluntly pointed. 12 veins; 7 and 8 stalked; 7 to apex; 9 out of stalk of 7 and 8; 2 from well before the end of the cell; 3 and 4 stalked from the end of the cell. Hindwings somewhat broader than the forewings; costal edge straight; termen oblique; apex bluntly pointed; 7 veins; 3 and

4 coincident: 5 approximate to (3 and 4); 6 and 7 parallel; 8 free. Posterior tibia hairy above.

Allied to *Filinota* Busck, with which it agrees in having 3 and 4 stalked in the forewings and coincident in the hindwings as well as in the long antennæ; but differing in the presence of the antennal pecten; in the longer terminal joint of the palpi, and in the stalking of vein 9 in the forewings with 7 and 8.

Genotype: *Lupercalia ignita*, new species.

LUPERCALIA IGNITA, new species

Labial palpi light golden yellow. Face silvery white. Antennæ golden with a broad black band beyond the middle and with black tips. The scales on the head, which are rather loosely applied, are yellow and carmine. Collar and posterior tip of thorax silvery white; a median transverse band dark lead-colored. Patagina yellow edged with carmine. Forewing grayish white with a broad costal edge reaching around apex bright golden yellow and lined with carmine and black scales. There are three conspicuous transverse silvery white blotches, one obliquely placed at base, edged with black, another perpendicular on dorsal edge just beyond the middle of the wing, edged with black and carmine, and a third and largest adjoining the golden apical area; this also is black-lined. Hindwings silvery white. Abdomen silvery white. Legs golden yellow.

Alar expanse: 16 millimeters.

Habitat: Trinidad River, Panama. May.

Type No. 14533, U. S. Nat. Mus.

PELEOPODA REGIELLA, new species

Labial palpi brick-yellow shaded externally with carmine. Face carmine. Head and thorax straw-yellow. Antennæ reddish ochreous with light yellow basal joint and cilia. Forewing with costal edge carmine; on the outer half of costa this color covers a broad margin and is gradually blended with a light purple occupying the middle of the apical part of the wing; this latter color is again gradually displaced with deep rich greenish golden yellow, which covers the greater part of the wing; basal part of the wing, except for the narrow costal edge, light straw-yellow. Cilia golden. Hindwings pale carmine with lighter golden cilia. Abdomen deep carmine; legs reddish ochreous; tuft on tibia and tarsi brighter ochreous. The forewings have vein 9 out of stalk of 7 and 8; 10 connate therewith.

Alar expanse: 26 millimeters.

Habitat: Cabima, Panama, May.

Type No. 14534, U. S. Nat. Mus.

Closely allied to *P. maroniella* Busck, and *P. notandella* Busck, though at once distinguished by its gorgeous coloration.

Family HEMEROPHILIDÆ

ORDRUPIA FANNIELLA, new species

Labial palpi dark brown; the terminal joint is deflected forwards, tortricia-fashion, and this may be the natural position also in the type of genus *friserella*, Busck. Face whitish ochreous. Head and thorax dark purplish brown. Forewings dark brown with a rich satin lustre; the scaling on the basal half of the wing is heavy and uneven, producing an undulating effect similar to that found in the forewings of certain limacodid moths; this is heightened by the tips of the scales appearing lighter-colored in certain lights. Hindwings dark brownish fuscous. Abdomen dark brown; lighter brown on the under side; legs brownish fuscous.

Alar expanse: 36 millimeters.

Habitat: Cabima, Panama, May.

Type No. 14535, U. S. Nat. Mus.

Closely allied to the type of the genus *O. friserella*, but larger, darker and with more rounded wings.

Due to my absence, while the paper was in press, the generic name *Ordrupia* was misspelled three times in the original description (Proc. U. S. Nat. Mus., Vol. 40, p. 228), twice through the omission of the letter "r" and once by substituting an "A" for an "O." The first of these misprints was unfortunately repeated in the table of contents to the bound volume of the Proceedings.

Family TINEIDÆ

PARATHYRIS PERSPICILLA Stoll.

Uitlandsche Kapellen, Vol. 5, p. 74, pl. 16, fig. 3. 1791.

In this remarkable genus the females have large feathered antennæ similar to those of the male Saturniidae, while those of the males are much smaller and simpler in form. This anomalous condition is not known elsewhere among the Lepidoptera, if in any other insects. Normally the males of the insects have the more specialized and larger antennæ. It would be interesting to learn whether this reversed development of the antennæ in *Parathyris* is

reflected in the biology of the species—in other words, whether the females seek the males for copulation instead of vice versa, as is the normal condition among insects.

The genus is not closely allied to any other known forms, but may be included in the family Tineidæ, from which it is an early branch, which has not been developed further. The reversed sexual dimorphism of the antennæ, which has not been perpetuated in any other Lepidoptera, is indicative of this.

As nothing has hitherto been known of the life history of *Parathyris*, it was particularly pleasing to find the larvæ of the present species in Panama. The larvæ feed on a woody fungus (*Polyporus*) in which they make long, irregular, silk-lined tunnels, to the opening of which is attached a large, cylindrical, somewhat flattened case, made of tough silk interwoven with dark-brown particles of the fungus. The cases are open at both ends; the anterior opening, attached to the fungus, is a round hole, which eventually is pulled close and woven over, when the larva is mature and prepares to pupate; the other opening is a transverse slit, kept closed by the elasticity of the walls of the case; through this slit the imago emerges, leaving the empty pupa skin protruding half-way from the case and held tightly in the slit.

The larvæ are gregarious, several cases being found protruding from the same fungus. The larger female cases are $1\frac{1}{2}$ inches long and nearly $\frac{1}{2}$ inch in width; the smaller male cases are about $\frac{3}{4}$ inch long by $\frac{1}{4}$ inch wide.

The full-grown larva is $1\frac{1}{4}$ inches long, cylindrical, slightly tapering at both ends, with normal well-developed thoracic and abdominal feet, the latter with a circle of hooks only broken by a short hookless space on the inner side. The head is yellow with black mouth parts. The body is white with black spots; on first thoracic joint is a yellow shield, divided longitudinally, edged by 6 black dots anteriorly and by two black lines posteriorly, and with a small black dot in the yellow on each side. On the second thoracic joint is a narrow transverse yellow shield broadly edged on all sides with black except on the median line. The third thoracic joint has two pairs of black dots above, the larger of which has a yellow center. Each of the abdominal joints has two pairs of small but conspicuous black dots above, three lateral black dots on each side and four small ventral dots. Anal plate is yellow.

I first met with these larvæ in April near Alhajuela and later found them some miles back of Paraiso, but in neither case did I succeed

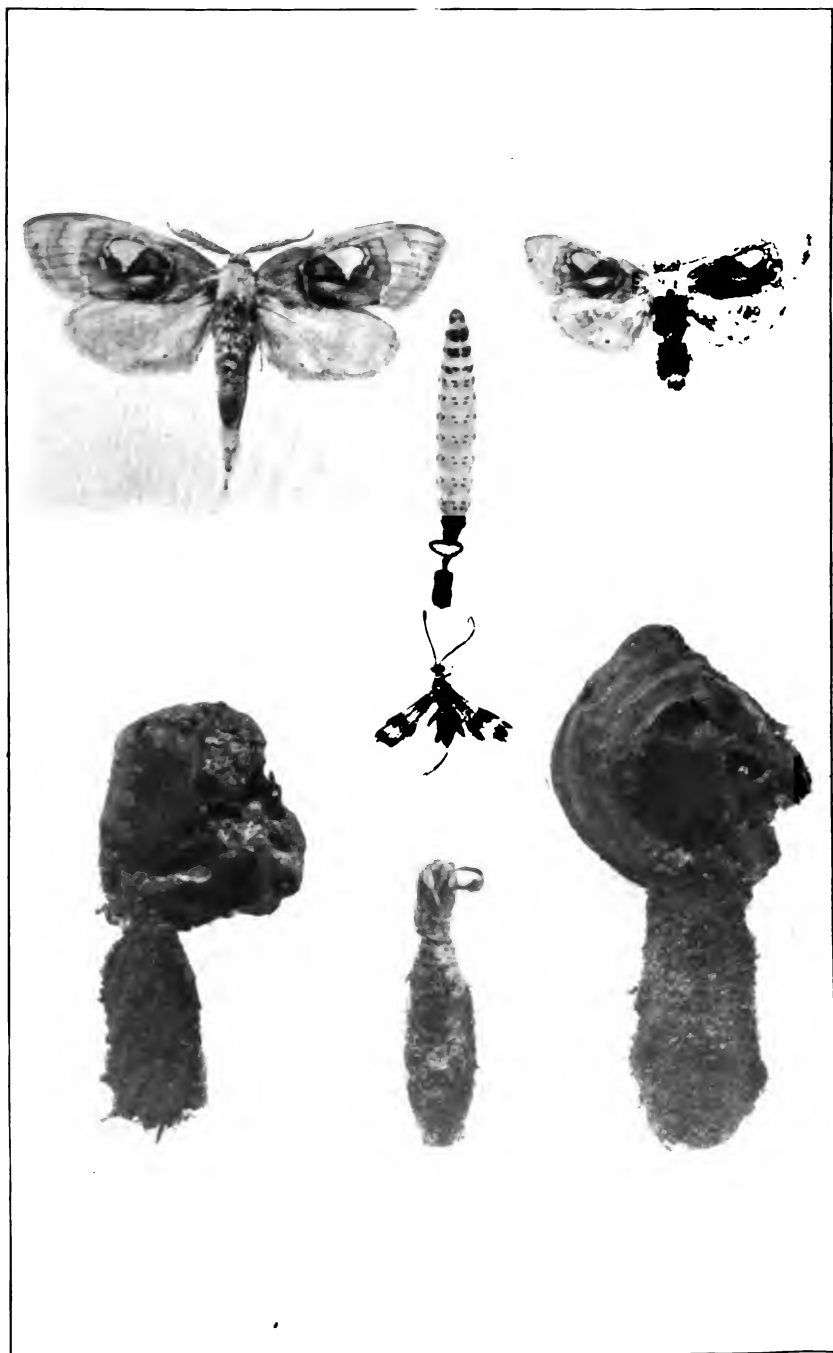
in rearing the moth, though one larva pupated and the pupa gave the clue to the genus, through the large antennal cases and the venation of the forewings, plainly observable through the pupa skin. From the Paraiso lot was bred the parasite, which proved to be a new genus and species and which will be described in a forthcoming paper by Mr. H. L. Viereck.¹

After my return to Washington, my friend Mr. Chas. P. Crafts of the Sanitary Department of the Canal Zone, who is himself an enthusiastic and successful collector and breeder of Lepidoptera, was good enough to send me fresh, nearly mature larvæ, from which I succeeded in rearing the imago in January, 1912, thus establishing the identity of the species.

I am under obligation to Mr. T. W. Smillie of the U. S. National Museum for the successful photograph, which shows, life-sized, this interesting insect, its larva, work, and parasite.

Structural figures of the new genera described in this paper will be published in a proposed complete paper on the collections of Microlepidoptera from Panama.

¹ Smithsonian Misc. Coll., Vol. 59, No. 5.



PARATHYRIS PERSPICILLA Stoll

FEMALE, MALE, LARVA, PUPA, COCOONS AND PARASITE

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 5

NEW GENUS AND SPECIES OF HYMENOP-
TERA OF THE FAMILY BRACONIDAE
FROM PANAMA

BY

H. L. VIERECK



(PUBLICATION 2080)

CITY OF WASHINGTON
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The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

NEW GENUS AND SPECIES OF HYMENOPTERA OF THE FAMILY BRACONIDÆ FROM PANAMA¹

By H. L. VIERECK

The following descriptions are published in advance of a report on the Ichneumonidea collected in Panama by Mr. August Busck in the course of the Smithsonian Biological Survey of Panama, in order that they may appear synchronously with a report of the host published by Mr. August Busck and containing a photograph² of both host and parasite.

SESIONOTONUS, new genus

This genus has characters in common with *Earinus* Wesmael and *Snellenius* Westwood, to the former of which it is certainly related. Carinæ bounding the mouth posteriorly, highly developed, buttress-like; lower part of front with a longitudinal crista between the scrobes; clypeus separated from the face above by a shallow furrow; face with two vertical impressed lines extending from each end of the furrow between clypeus and face half-way up the latter; maxillary palpi 4-jointed; areolet subpetiolate, triangular; nervellus not at all broken; claws simple; propodeum not at all carinate, with elliptical spiracles; first dorsal segment approximately as long down the middle as wide at apex, not carinate; otherwise essentially as in *Earinus* Wesmael, as represented by the genotype.

Type.—*Sesioctonus parathyridis*, new species.

SESIONOTONUS PARATHYRIDIS, new species

Female.—Length 11 mm.; head black and polished; face sparsely punctured, clypeus less so; first and second joints of palpi black, remaining joints stramineous; other mouth parts mostly black or blackish, flagel 44-jointed, most joints longer than thick, 25th to 35th joints mostly a little thicker than long; prothorax mostly black. The upper and lower hind angles of the lateral aspect of the pronotum stramineous; fore legs mostly black; rest of thorax including the

¹ The present paper is the ninth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

² Smithsonian Misc. Coll., Vol. 59, No. 4, pl. 1, 1912.

tegulae reddish stramineous and concolorous with the propodeum; fore tarsal joints blackish except at base, where they are pale, the onychium, however, entirely black, their claws black with reddish tips; other legs colored like the fore legs except that the mid coxae are stramineous at base and concolorous with the mid distal trochanters, all tarsal joints blackish throughout and the claws mostly reddish; wings yellowish, costa and stigma mostly black, apical fifth of fore wings and apical two-fifths of hind wings blackish, including the parts of veins in these areas—the fore-wings in addition with a blackish band involving membrane and parts of veins of the fourth sixth of the wing excepting the areola; thorax smooth and polished, the dorsulum not at all impressed; abdomen smooth, polished and stramineous except sixth, seventh and eighth segments, which are black dorsally; hypopygium not extending as far as the pygidium; exerted portion of ovipositor as long as the body, reddish black, the sheaths black, tipped with stramineous.

Type locality.—Paraiso, Canal Zone, Panama.

Type.—Cat. No. 14552, U. S. N. M.

Reared indoors, December 27, 1911, from pupae of *Parathyris perspicilla* Stoll, by Mr. August Busck.

The cocoon of this parasite is made up inside the host's case of loosely arranged white silk.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 6



THE GENERA OF FOSSIL WHALEBONE WHALES ALLIED TO BALÆNOPTERA

BY

FREDERICK W. TRUE



(PUBLICATION 2081)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
APRIL 3, 1912

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THE GENERA OF FOSSIL WHALEBONE WHALES ALLIED TO BALÆNOPTERA

By FREDERICK W. TRUE

In preparing to study and identify the remains of Tertiary whale-bone whales contained in the collections of the United States National Museum, I had occasion four years ago to examine the literature relating to these forms, and also the type-specimens of North American species, so far as they were available. The two principal works relating to extinct finback whales are Van Beneden's "Description of Fossil Remains from the Vicinity of Antwerp"¹ and Brandt's "Fossil and Subfossil Cetacea of Europe."²

I studied Van Beneden's work attentively, and endeavored by means of comparative tables, composed of data extracted from the accounts of the various genera, to form diagnoses by which they could be discriminated. This undertaking, though it involved much labor, proved unremunerative, for the reason that the information given by Van Beneden is inexact, conflicting, and insufficient. While the text of this work is thus very unsatisfactory, the illustrations which accompany it are of the highest excellence and importance.

¹ VAN BENEDEN, P. J.—Description des Ossements Fossiles des Environs d'Anvers. Brussels, 1877-1886. Folio.

Pt. 1. Pinnipèds ou Amphithériens. Ann. Mus. Roy. Hist. Nat. Belg., ser. Paleont., vol. 1, 1877. Pls. 1-18.

Pt. 2. Genres *Balanula*, *Balæna* et *Balanotus*. *Op. cit.*, vol. 4, 1880. Pls. 1-39, 1878.

Pt. 3. Genres *Megaptera*, *Balanoptera*, *Burtinopsis*, et *Erpetocetus*. *Op. cit.*, vol. 7, 1882. Pls. 1-109.

Pt. 4. Genre *Plesiocetus*. *Op. cit.*, vol. 9, 1885. Pls. 1-30.

Pt. 5. Genres *Amphicetus*, *Heterocetus*, *Mesocetus*, *Idiocetus* et *Isocetus*. *Op. cit.*, vol. 13, 1886. Pls. 1-75.

² BRANDT, J. F.—Untersuchungen über die fossilen und subfossilen Cetaceen Europa's. Mém. Acad. Imp. Sci. St. Petersburg, ser. 7, vol. 20, no. 1, 1873, pp. i-viii, 1-372, pls. 1-34.

Ergänzungen zu den fossilen Cetaceen Europa's. *Op. cit.*, vol. 21, no. 6, 1874, pp. i-iv, 1-54, pls. 1-5.

They constitute, indeed, the only comprehensive series of good illustrations of fossil whalebone whales thus far published.

Brandt's work, unlike the foregoing, is in large measure critical and exact, but is, nevertheless, somewhat unsatisfactory on account of its discursiveness, its numerous supplements, and its more or less involved and indefinite system of classification. It suffers also from its very badly drawn plates, which, in many instances, are entirely useless for critical comparisons.

On account of the obscurity in which the subject was involved, I finally determined to disregard the literature, and to endeavor to form diagnoses directly from the illustrations furnished by American and European authors, including those already mentioned, together with such specimens as were available for study. The resulting diagnoses based on characters of the skull, which are given below, were completed May 1, 1909. A few months afterwards I received a copy of Dr. Winge's paper on *Plesiocetus* and *Squalodon* from Denmark,¹ which contains very valuable critical remarks on the fossil genera under consideration, though no attempt is made to formulate diagnoses of them. His opinions are, however, in close accord with my own, and as the article is written in Danish, it has seemed to me desirable to present a translation of his remarks in this place, in so far as they relate to the American forms. (See p. 5.)

A summary of his conclusions is as follows:

VALID GENERA OF FOSSIL WHALEBONE WHALES, ACCORDING TO WINGE²

<i>Aulocetus</i>	<i>Cetotherium</i>	<i>Megaptera</i>
<i>Balænoptera</i>	<i>Herpetocetus</i>	<i>Plesiocetus</i>

GENERA OF DOUBTFUL VALIDITY, ACCORDING TO WINGE

<i>Cetotheriomorphus</i>	<i>Pachycetus</i>	<i>Tretulias</i>
<i>Mesoteras</i>	<i>Rhegnopsis</i>	<i>Ulias</i>
<i>Metopocetus</i>	<i>Siphonocetus</i>	

The complete list of genera considered by Winge, with his opinion and my own regarding each, is as follows:

¹ WINGE, H.—Om *Plesiocetus* og *Squalodon* fra Danmark. Vidensk. Meddel. fra den naturhist. Foren. i Kjøbenhavn for 1909, pp. 1-38, pls. 1, 2. 1910.

Separately published, April 20, 1909.

² The genera of Right whales and the genus *Rhachianectes* are not included.

	WINGE	TRUE
<i>Amphicetus</i> Van Ben.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Aulocetus</i> Van Ben.	Valid.	Concurrence.
<i>Balanoptera</i> Lacép.	Valid.	Concurrence.
<i>Burimopsis</i> Van Ben.	Equals <i>Megaptera</i> Gray.	Equals <i>Plesiocetus</i> ?
<i>Cetotherium</i> Brandt.	Valid.	Concurrence.
¹ <i>Cetotheriophanes</i> Brandt.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Cetotheriopsis</i> Brandt.	Equals <i>Aulocetus</i> Van Ben.	Concurrence.
<i>Cephalotropis</i> Cope.	Equals <i>Plesiocetus</i> Van Ben.	Valid ?
<i>Cetotheriomorphus</i> Brandt.	Doubtful.	Concurrence.
¹ <i>Eucetotherium</i> Brandt.	Equals <i>Cetotherium</i> Brandt.	Concurrence.
<i>Herpetocetus</i> Van Ben.	Valid.	Probably equals <i>Plesiocetus</i> .
<i>Heterocetus</i> Van Ben.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Isocetus</i> Van Ben.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Idiocetus</i> Capellini.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Mesocetus</i> Van Ben.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Metopocetus</i> Cope.	Probably equals <i>Plesiocetus</i> Van Ben.	Valid ?
<i>Mesoteras</i> Cope.	Doubtful.	Concurrence.
<i>Megaptera</i> Gray.	Valid.	Concurrence.
<i>Megapteropsis</i> Van Ben.	Equals <i>Megaptera</i> Gray.	[Not studied.]
<i>Plesiocetus</i> Van Ben.	Valid.	Concurrence.
¹ <i>Plesiocetopsis</i> Brandt.	Equals <i>Plesiocetus</i> Van Ben.	Concurrence.
<i>Pachycetus</i> Van Ben.	Doubtful.	Concurrence.
<i>Rhegnopsis</i> Cope.	Probably equals <i>Cetotherium</i> .	Doubtful.
<i>Siphonocetus</i> Cope.	Probably equals <i>Cetotherium</i> .	Doubtful.
<i>Tretulias</i> Cope.	Doubtful.	Concurrence.
<i>Ulias</i> Cope.	Doubtful.	Concurrence.

The subjoined diagnoses of the genera are, as already mentioned, based only on characters of the skull, as a full comparison of the remainder of the skeleton is not feasible at this time. It is recognized that they are incomplete and subject to revision, but it is thought that they may be of use as a basis for a fuller characterization of the genera.

DIAGNOSES OF GENERA OF FOSSIL WHALEBONE WHALES ALLIED TO BALÆNOPTERA

BALÆNOPTERA Lacépède. 1805²

Orbital plates of frontal on a lower level than vertex, much produced anteriorly. Maxillæ produced proximally in a narrow extension at side of nasals. Proximal end of premaxillæ narrow, scarcely

¹ Subgenus.

² *Megaptera* cannot be distinguished from *Balænoptera* generically by the skull alone.

reaching superior surface; ending opposite distal end of nasals, or as a narrow slip of bone on each side of them. No temporal ridge. Parietals scarcely appearing on vertex. Frontals very short on vertex. Nasals moderate. Tympanic bone with a ridge on inner side (that is, on the border nearest the median line of the skull). Alveolar groove and dental canal of mandible as in *Plesiocetus*. Proximal end of mandible solid. Orifice of dental canal small. Alveolar groove roofed.

AULOCETUS Van Beneden. 1861

Orbital plate of frontal less descending than in *Balanoptera*, not so much produced anteriorly, and with a trace of a temporal ridge. Form of maxillæ proximally, and form of parietals and frontals on vertex, as in *Balanoptera*. Nasals very long. Proximal end of premaxillæ as in *Balanoptera*, but broader and more superiorly placed. Tympanic bone with a ridge on internal border (that is, on the border nearest the median line of the skull). Maxillæ very broad. Premaxillæ expanded distally and inserted between maxillæ and nasals proximally. Mandible not very convex externally at posterior end, nor emarginate toward inferior border; not deeply concave internally (hence, as in *Balanoptera*). Alveolar groove and dental canal as in *Plesiocetus* (?). Alveolar groove roofed.

PLESIOCETUS Van Beneden. 1859

Orbital plate of frontal not abruptly on a lower level than vertex, trumpet-shaped, not produced anteriorly; with a distinct or indistinct temporal ridge. Parietals on vertex long or moderate; frontals the same. Nasals long. Maxillæ rather narrow, without a proximal nasal branch, or extension. Proximal end of premaxillæ broad, superiorly placed, and articulating with frontals by a very coarse and deep interdigitating suture. Tympanics flat or concave on internal border (that is, on the border nearest the median line of the skull). Proximal end of mandible convex externally, with a more or less pronounced emargination near inferior border; internally, very concave. Alveolar groove and dental canal confluent, the former roofed over. Gingival foramina on the inner side (?).

NOTE.—The vertex of *Plesiocetus* does not seem to be well-known, but as Van Beneden's figures of other parts correspond to those of *Heterocetus*, etc., it may be safe to assume that the vertex has the same form as in those nominal genera. The genus *Plesiocetus* may be regarded as including *Heterocetus* Van Ben., *Amphicetus* Van Ben., *Mesocetus* Van Ben., *Idiocetus* Capellini, *Isocetus* Van Ben., and probably also *Herpetocetus* Van Ben. and *Burtinopsis* Van Ben.

CETOTHERIUM Brandt. 1843

Orbital plate of frontals, and parietals and frontals on vertex, as in *Plesiocetus*. Posterior nasal extension, or process, of maxillæ as in *Balænoptera*, but broader, more triangular, and less distinctly marked off. Maxillæ narrow. Premaxillæ inserted between maxillæ and nasals proximally as in *Balænoptera*; not expanded distally (?). Nasals moderate. Tympanic bone rounded internally (that is, on the edge nearest the median line of the skull). Alveolar groove and dental canal as in *Plesiocetus* (?). Alveolar groove roofed.

CEPHALOTROPIS Cope. 1896

Differs from *Plesiocetus* only in having the apex of the supra-occipital very rugose and deeply pitted.

METPOCETUS Cope. 1896

Differs from *Plesiocetus* only in having the parietals on the vertex rather shorter and the nasals also short.

GENERA BASED ON MANDIBLES

SIPHONOCETUS Cope. 1895

Alveolar groove and dental canal distinct. Groove roofed over and perforate.

NOTE.—I suspect that these characters are of no value and that *Balænoptera*, *Aulocetus*, *Cetotherium*, and *Plesiocetus* are all alike as regards the canal and groove.

ULIAS Cope. 1895

“Alveolar groove and dental canal confluent in a gingivodental canal.” Canal open. No gingival canals.

TRETULIAS Cope. 1895

Similar to *Ulias*, but with gingival canals at the sides of the mandible.

WINGE'S CRITICISMS OF COPE'S GENERA

Winge's comments on Cope's genera are appended.

Siphonocetus Cope.—“To Cope's account [of this genus] two objections have to be made. In the first place, it is certain that Cope's interpretation of the canals in the lower jaw is incorrect. To conclude from his figures, representing diagrammatically a section of the

lower jaw, it appears that the *sulcus alveolaris*,—the furrow in the upper border of the mandible in which the embryonic rudimentary teeth are lodged (which ordinarily disappears in adult finback whales),—fills up almost entirely with bony tissue; that the *canalis mandibularis*,—the canal in the interior of the jaw, in which the third branch of the *nervus trigeminus* and the accompanying blood-vessels run,—is divided into an upper and a lower branch, while, as a rule, it is undivided. From the upper branch—Cope's 'alveolar groove,' *sulcus alveolaris*—proceed, on each border, *foramina mentalia*, which are simply orifices of side branches from the *canalis mandibularis*.

"As regards the second objection, the mandible in *Cetotherium* shows in section an entirely similar figure to Cope's *Siphonocetus*. Brandt figures it in the type of the genus, *C. rathkei*. On the score of the canals of the lower jaw, there was no ground for establishing a new genus. *Siphonocetus* is, therefore, much in need of new proofs." (*Op. cit.*, p. 25.)

Ulias Cope.—"The characters of the genus are that the *canalis mandibularis* and *sulcus alveolaris* are not separated, and together form a broad, wide-open canal in the upper border of the mandible, which may, however, be closed near the anterior end of the jaw; and that the *foramina mentalia* are wanting, except at the very front. Cope believed that *Ulias*, when adult, retained characters which are found elsewhere in embryonic Right whales. But Cope's interpretation is certainly not correct. The lack of the *foramina mentalia* alone is so extraordinary that it gives grounds for questioning whether the upper border of the jaw in the specimen concerned is really undamaged. From the figure, which represents a diagrammatic section, one gets an impression of the jaw that is very far from reminding one of an embryo of a Right whale; that it is as in the fully grown Finbacks, but that the upper border is broken off, so that the bottom of the *canalis mandibularis* has become visible. This explanation is, however, a guess, but it may be right, nevertheless. It should also be remembered that it is very difficult in a weathered bone to distinguish broken surfaces from natural surfaces. In order that the genus *Ulias* may be accepted, there must be presented a far more carefully prepared account of it than that which Cope has given." (*Op. cit.*, pp. 26-27.)

Tretulias Cope.—"*Tretulias* was established by Cope from two pieces of the lower jaw from the North American Miocene, one piece 'in fairly good preservation,' the other 'considerably worn.' The single species is *T. buccatus*. The characters of the genus are that the *canalis mandibularis* is 'obliterated' and that the *sulcus alveolaris* is open, without a bony roof, except along the inner border, where there are found 'gingival canals and foramina.' Cope's interpretation cannot be correct. That the *canalis mandibularis* should be 'obliterated' is inconceivable. What he calls the 'dental groove'—*sulcus alveolaris*—is clearly enough the *canalis mandibularis*, to judge from the figure, a diagrammatic section of the jaw. As in *Ulias*, it is sure that a piece of the upper border of the jaw is broken

off, but that the inner wall has remained further back than in *Ulias*." (*Op. cit.*, p. 27.)

Metopocetus Cope.—"*Metopocetus* was established by Cope on a much-damaged skull from the Miocene of North America. The species is called *M. durinasus*. Cope himself thought that it might be the same genus as *Ulias* and *Tretulias*, which are known from the lower jaw. The genus probably stands near *Cetotherium* (with *Plesiocetus*), but differs especially in that the nasals are short and almost ankylosed together and with the frontals. In addition, there is a difference in the temporal crest, which, however, to judge by the figure, is not distinct. The skull on which the genus is founded is so much damaged that the relation of the frontals and nasals cannot be clearly seen, and the length of the nasals cannot be correctly guessed. If Cope was right in his opinion that the bones were ankylosed, that would not be sufficient ground for establishing a new genus. Anchylosis may result from advanced age, or from pathologic conditions. Nearly ankylosed nasals are figured by Cope himself in *Cetotherium megalophysum*. From the figure, which, however, is only an outline of the skull seen from above, *Metopocetus* agrees so well with *Plesiocetus* that a generic difference is not probable."¹ (*Op. cit.*, pp. 27-28.)

Cephalotropis Cope.—"*Cephalotropis* was established by Cope from a very imperfect skull from the Miocene of North America. The single species is *C. coronatus*. Cope himself thought that it might be the same genus as *Ulias* or *Tretulias*. From *Cetotherium* (with *Plesiocetus*) it is supposed to differ in having temporal ridges, or angles, which are lacking in *Cetotherium*; but that is an error. The anterior part of the temporal crest, that which is referred to, is essentially the same in all extinct Finbacks. To judge from the figure, there is no ground for separating *Cephalotropis* from *Plesiocetus*." (*Op. cit.*, p. 28.)

Rhegnopsis Cope.—"*Rhegnopsis* was founded by Cope on a fragment of a mandible from the Miocene of North America. On the same piece Leidy established his *Balæna palæatlantica*, which later, without any further explanation, was transferred to a new genus, *Protobalæna*. That generic name, however, was not valid, as Cope pointed out, since it had already been used by Van Beneden in another sense, and Cope adopted the name *Rhegnopsis* instead. The only ground for the separation of *Rhegnopsis* from *Cetotherium*, or other allied Finbacks, is the presence of a 'Meckelian fissure,' a slit which extends from the inner side of the jaw deep in through the interior of the bone. In reference to the slit, Cope wrote in 1865 (p. 145): 'I am inclined to doubt whether it is normal in adult animals. When the rami of recent *Balænidæ* dry, they sometimes split along the line of the primitive Meckelian groove, but not

¹ I would remark as regards the nasals, which I have examined in the type-specimen, that they are complete anteriorly as shown in Cope's figure, and hence quite short.

always. It remains to be seen whether this is the origin of the fissure in the present species.' Cope does not say whether he had investigated the question when he established the genus *Rhegnopsis* in 1896, though an investigation was much to be desired. From the figures, which are diagrammatic sections of jaws, it appears that Cope's 'Meckelian fissure' in *Tretulias* and *Rhegnopsis* is nothing more than an artificial crack. It is, at all events, entirely different from the 'Meckelian fissure,' *sulcus mylohyoideus*, which, as a shallow canal, follows more or less the lower border on the inner side of the jaw in various Right whales. *Rhegnopsis* is, in any case, of very doubtful validity." (*Op. cit.*, pp. 28-29.)

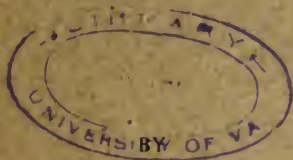
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WITH ONE PLATE



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Of Leland Stanford Junior University



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(WITH ONE PLATE)

During June and July, while attending the 1910 session of the Marine Biological Laboratory of Stanford University at Pacific Grove, California, the writers had an opportunity of observing certain phases of the life history of *Emerita*, which, as they do not appear to have been mentioned in literature, seem worthy of recording, particularly as they furnish some extremely fine examples of the correlation of structure and habits. Garstang, in several admirable papers pointing out the close correlation in various Crustacea between structures not commonly considered useful and the habits of the animals possessing them, very justly claims that while morphology and embryology have received a vast amount of attention, "bionomics" has been neglected and as a result the significance of many structures is entirely missed, while even their morphology is often incorrectly interpreted because their function is ignored or merely inferred from their form.

The aphorism of Jeffries Wyman: "The isolated study of anything in Natural History is a fruitful source of error", is strikingly illustrated in the morphological views that have been advanced for the significance of some of the structures in *Emerita*, as well as the numerous cases cited by Garstang. It seems curious that so many investigators shrink from the often trivial expenditure of time and energy involved in the experimental method of checking and completing their morphological work, when this almost invariably brings such a large return. It is as a slight contribution toward interpreting some of the well-known features of *Emerita*, that the following observations are offered.

The genus *Emerita*—the better known name *Hippa* has been transferred to *Remipes*—is represented on the Pacific Coast of North America by two species of wide distribution. One, *Emerita emerita*

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(Linn.), ranges, according to Miss Rathbun,¹ from Lower California to Chili and is also found on the east coast of Brazil; the other, with which we have to do in the present paper, *Emerita analoga* (Stimp.), is found on sandy beaches from Oregon to Chili.² Neither of these differs widely from the well-known *Emerita talpoida* (Say), in fact some authors include all three in a single species, and it is probable that their habits are essentially similar.

The related family Albuneidæ is represented by two species, *Blepharipoda occidentalis* Randall, and *Lepidopa myops* Stimpson, both from Southern and Lower California, but these are less abundant and no opportunity has presented itself of observing their habits.

Emerita analoga, locally known as the "sand crab", or sometimes as the "sand flea", appears to be present in California on all sandy beaches exposed to the surf. We have had the opportunity of examining them in the vicinity of Swanton, Santa Cruz County, near Pacific Grove, Monterey County, and at Alamitos Bay, Los Angeles County, and have handled material from several other localities on the California coast.

In Southern California the "soft shelled", or newly molted individuals, which are looked upon as a different kind, are extensively used for bait in surf fishing. According to Miss Rathbun³ they are not only used for bait, but as an article of food on the coast of Peru, where they are known as "Mui-muis".

Though the structure and development of *Emerita* are well known, little work seems to have been done on their habits. S. I. Smith has given the most complete account of the habits of *Emerita talpoida*, in connection with a full study of the larval stages,⁴ but even this is rather meager, and, moreover, as he was unable to observe certain points, he has incorrectly interpreted them. Benedict gives a few observations concerning *Lepidopa*,⁵ and Garstang⁶ some features in the respiration of a European species of *Albunea*. These views will be considered in their appropriate connection.

It will be convenient to consider the habits and the structural features involved in the following order: habitat, burrowing, food-getting, and respiration.

¹ Proc. U. S. Nat. Mus., Vol. 38, p. 554. 1910.

² Rathbun, *loc. cit.*; Holmes, Occas. Papers Calif. Acad. Sci., Vol. 7, p. 103. 1900.

³ Proc. U. S. Nat. Mus., Vol. 38, p. 554. 1910.

⁴ Trans. Conn. Acad., Vol. 3, p. 311. 1877.

⁵ Proc. U. S. Nat. Mus., Vol. 26, p. 889. 1903.

⁶ Quart. Journ. Micr. Sci., Vol. 40, p. 224. 1897.

HABITAT

The sand crab inhabits a strip of beach in or near the wash of the waves. Here it is distributed from the high-tide limit, for a given tide, to a short distance beyond the point where the waves strike the sand, but the center of abundance is that portion washed by each wave. During a very low tide at Alamitos Bay, the crabs did not follow the wave wash out to its lower limit, but stopped at an intermediate point. Further observations at Swanton confirmed this.

Although occasionally found singly, *Emerita* is essentially a gregarious animal. It occurs in large "beds", which are marked by small V-shaped ripples in the sand. Here, as Leidy has said of the eastern form, they are as thick as currants in plum pudding. If one turns over the sand of one of these beds he will find the sand crab in incredible numbers lying within a few inches of the surface. In these places adults and young of both sexes may be found associated. Generally mature females and males are at once distinguished by the difference in size (see figs. 1 and 2, pl. 1). For this reason collections often consist of females only, the smaller males being regarded as young. Measurements of the carapace of 27 specimens (length from rostrum to median posterior dorsal margin) of each sex collected at Pacific Grove give the following: average of males (all with enlarged genital papillæ) 12.4 mm., range 10.5 to 14.5 mm.; average of females (all egg-bearing) 21.4 mm., range 17 to 25.5 mm. The males are without pleopods, while the second, third and fourth segments of the abdomen of the females are provided with them. The telson of the adult female is more heavily ciliated along its lateral margin and is somewhat wider than that of the male. The following are measurements of two typical specimens: female, length of carapace 20.3 mm., length of telson 13 mm., width of telson 6.9 mm., width 53 per cent of length; male, length of carapace 11 mm., length of telson 7.6 mm., width of telson 3.3 mm., width 43 per cent of length.

The following brief data on the period of egg-bearing in *Emerita analoga* have been gathered from the material at hand, and, although incomplete, may throw some light on its duration. Of 45 females collected at Swanton on January 5, 1911, none were carrying eggs, although many young females were present. Out of four females taken at Alamitos Bay on January 4, 1911, one carried small eggs in which the eye pigment had not appeared. A single adult female from Humboldt Bay, May 28, 1911, was not egg-bearing. During June, 1910, females carrying eggs of all stages from those ready to hatch to those in which the eye pigment had not yet formed were abundant

at Pacific Grove. Many of the maturer eggs hatched in the laboratory. A number of female specimens collected on July 11, 1906, at the same place, carried eggs without eye spots. In a lot of eight females from Little River near Trinidad, collected August 28, 1911, seven carried eggs, those from one specimen only showing the eye pigment. A series of 35 females, from San Diego (date unknown), included 14 egg-bearing individuals, the smallest of which had a carapace length of 11 mm.; four others were of practically the same dimensions. This is apparently the limit of egg-bearing size.

BURROWING

While there are many burrowing species among the Crustacea, *Emerita* and its allies show a degree of adaptation to this kind of life far more complete than found elsewhere. To understand this we must consider their peculiar habitat. Many burrowing forms live in mud or sand in still water or at least in sheltered positions—*Callinassa* and *Upogebia*—where a permanent hole is formed. Others, as the Cancridæ, cover themselves in the loose sand or gravel in shallow water or along sheltered shores. In *Emerita*, however, the method of food-getting, to be described later, requires that they occupy exposed sandy beaches exactly within the action of the waves. In this position they maintain themselves near the surface. It is not easy to realize the ceaseless activity necessary to keep this position. With every wave the top layer of the sand is converted into a fluid which is swept by the current with surprising rapidity. Any solid object in or on this surface layer is at the same time undermined and shifted by the force of the water. Every bather knows what insecure footing is furnished by the sand in shallow water where the action of the waves is strong. If the beach is carefully examined for several days in succession, it will also be seen that the sand has been shifted, the movement often affecting a layer several feet thick in a single day. As a result the animal dislodged or uncovered by each wave must reestablish itself to be in readiness for the receding wave from which its food is obtained.

As pointed out by Smith⁷ their peculiar oval shape is well adapted for burrowing in the sand. It is interesting to note that a shape superficially very similar to that of the Hippidæ appears in a very different group, the Raninidæ among the true crabs, which are also burrowing forms.

⁷ Trans. Conn. Acad., Vol. 3, p. 312. 1877.

While the wave is in, *Emerita* may often be seen swimming about close to the surface of the sand, but as the wave recedes they bury themselves. This behavior suggested to us that they might follow the movements of the tide up and down the beach so as always to be within the wash of the waves, but as already stated observations failed to show that this took place to any marked degree.

If they are turned out with a spade, they burrow into the water-saturated sand with astonishing rapidity. They are unable to burrow readily in the dryer sand farther up the beach and when placed upon it cover themselves only after several attempts. Their method of burrowing may best be observed by placing them in a dish containing a shallow layer of wet sand. By reference to figs. 1, 2 and 3, pl. 1, it will be seen that the general form of the body is ovoid, and that the dactyls of all the legs are flattened and expanded to serve as digging organs. In burrowing, *Emerita* invariably moves backwards,* stirring up the sand with some of the appendages while pushing and swimming backwards with others until it is covered. The detailed action of the parts involved is somewhat as follows: the uropods, which appear to be the most important, strike upwards and forwards in unison tending to throw the loose sand upon the back, or, where the sand is firmer, to force the body downward and backward. The four large pereopods take part in the process in varying degrees, apparently in each case acting alternately. The last pair, which, it will be noted, are directed backward along the sides of the body (fig. 3, pl. 1), move laterally, pushing the sand to each side. The two middle pairs act much as in walking, that is, in such a way as to thrust the body backwards, the broad trowel-like dactyls serving to catch in the sand. The flattened first pair of pereopods corresponding to the chelipeds of allied forms, which are held forward, are used to scull the body backward, so that under the combined action of all these appendages the animal is carried diagonally downward and backward until the anterior end of the carapace is just covered. *Emerita* seldom goes more than a few millimeters below the surface except when trying to escape or under unnatural conditions, and usually remains with some of the appendages exposed in a manner soon to be described. When burrowing they always work against the current and consequently, as the wave runs off, are left facing the sea—a position of some importance in connection with their feeding habits.

* "This species [*Emerita talpoida*] burrows like a mole, head first, instead of backwards." Verrill, Report U. S. Fish Commission for 1871-72, p. 338. 1873.

FOOD-GETTING

The investigation of the method by which *Emerita* obtains its food forms the main part of the present work and has furnished the most important results. As far as the literature examined by the writers is concerned, there appears to be little mention of food, and the speculations concerning the organs which are used in feeding show how far pure morphology may go astray. In the paper of Smith's already mentioned, he says, "The mouth parts of the adult are not adapted for ordinary prehension or mastication, but I am unable to make any positive statement in regard to the food of these animals. In all specimens examined the alimentary canal was filled with fine sand which seemed to be nearly free from animal or vegetable matter. The material from the stomach, however, shew, under the microscope, a small quantity of vegetable matter, and it seems probable that the sand is swallowed for the nutritive matter it may contain".⁹ In regard to the antennæ, the chief organs in feeding, he says, "Judging from the peculiarly armed setæ of the flagella, one of the principal offices of the antennæ is the removal of parasitic growths and all other foreign substances from the appendages of the anterior portion of the animal".¹⁰ These meager notes are all the data that we have been able to find.

Under normal conditions, on the part of the beach left uncovered by the receding wave, the animals will often be found, if they have not been disturbed by the observer's footsteps, facing the sea with the rostrum just below the surface of the sand, while the stalked eyes and the antennules project slightly. If one stands in the midst of a bed while the wave sweeps over it, he will see little change at first, but as soon as the water begins to run down the beach, the crustaceans will thrust out their antennæ, normally hidden beneath the external mouth parts, and hold them directed forward and laterally with the tips curved outward. Here the antennæ remain, except for one or two momentary infoldings, until the last film of water has drained off, when they are again coiled beneath the mouth parts.

The water running past the antennæ forms, on the beach, the characteristic V-shaped marks, already mentioned, by means of which the presence and extent of a bed may often be clearly made out at a considerable distance.

⁹ Trans. Conn. Acad., Vol. 3, p. 313. 1877.

¹⁰ *Loc. cit.*

It requires only an examination of the structure of the antennæ and of the contents of the stomach to make clear the process of feeding. The stomach is found to contain not only "vegetable matter" as noted by Smith, but also microscopic animals. We have, in the antennæ and mouth parts, structures admirably adapted for straining such organisms from the waves, and the use, just mentioned, of the antennæ is not intelligible on any other assumption. There can be little doubt, therefore, that the food, instead of being swallowed with the sand, is strained from the water and transferred to the mouth. To understand the process more clearly let us consider, first, the structure of the antennæ and mouth parts and, second, the stomach contents.

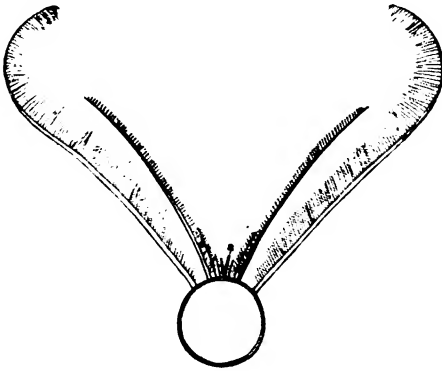


FIG. 1.—Cross section of antenna of adult female *Emerita* taken near base, showing arrangement of setæ.

The form of the antennæ has been accurately described by Smith.¹¹ The concave side is provided with four rows of large diverging setæ armed with secondary setæ directed inward (fig. 1 and pl. 1, fig. 5). In addition there are 5 or 6 smaller setæ lying nearer the median line (8 to 12 are described by Smith for *E. talpoida*). One of these, rather thicker than the rest and lacking the secondary setæ, occupies a median position and exhibits a pit in the tip suggestive of a sensory organ (a, fig. 1). The antennæ thus present to the water flowing against the concave side a very efficient straining apparatus.

Attempts were made to seize the extended antennæ, and by examination, to determine what was being captured, but the animals proved too active and the few taken in this manner showed only sand grains. The antennæ of a preserved specimen from Little River near Trini-

¹¹ Trans. Conn. Acad., Vol. 3, p. 325. 1877.

dad, California, were examined and a few diatoms were found entangled in the hairs together with sand grains and unrecognizable debris, similar to that obtained from the stomach.

The mouth parts are admirably adapted for the manipulation of these minute organisms which the antennæ have strained from the waves. In the normal position of the parts one is struck by the great development of the external (third) maxillipeds (fig. 4, pl. 1), which like double doors cover the entire buccal region of this remarkable animal. Along the median line they meet closely at the base; near the distal end they diverge slightly, but the longer hairs in this region still serve to close the cavern. Posteriorly the closely approximated bases of the first pair of pereopods curve forward and overlap slightly the posterior edge of the external maxillipeds, completely closing the cavern in that direction. A small diamond-shaped hole which would otherwise be left in the median line between their bases and the proximal ends of the third maxillipeds is closed by the tips of the palps. Laterally, the external border of the operculiform ischial joint, which is also ciliated, comes accurately in contact with the pterygostomian plate for rather more than half its length. Anterior to this, it fits against the basal portion of the antennæ, so as to completely close the cavity at this point. The cavern is least complete in front. Immediately below the antennules and eyes lie the crossed distal portions of the antennal peduncles, and against these the tips of the third maxillipeds rest. Crannies which might otherwise remain open are stopped by the greater development of hairs in this region (fig. 7, pl. 1). When the antennæ have been folded, they are thus inclosed in a cavity in which the food they have caught may be removed and transferred to the mouth without loss. For this use the other mouth parts are well adapted. The relation of the parts is well shown by fig. 7, pl. 1, which represents the buccal region exposed by turning back the external maxillipeds.

Careful observation shows that when *Emerita* is undisturbed it folds in the antennæ separately as the wave runs off the beach. Each flagellum is allowed to trail out nearly parallel with the body, and then is folded up and withdrawn under cover of the third maxillipeds with such a rapid motion as to escape analysis. Inside the buccal cavern each antenna is coiled loosely with the food-laden bristles pointing toward the center (fig. 7, pl. 1). From the anterior portion of the cavern the two palps of the second maxillipeds, armed with bristles arranged like those of a tube brush, project down into the coil of the antennæ. These are apparently used to scrape the food toward the

slit-like mouth. Portions of the first maxilliped and of the first and second maxillæ flank the elongate mouth and are provided with long stiff setæ, which are curved over the margin and directed upward into the gullet. These three comb-like structures apparently serve as valves to prevent the escape of the minute food and to work it into the mouth. The mandibles, which correspond closely with Smith's description¹² of those in *E. talpoida*, are very much reduced, and are so soft as to be of no use in mastication, thus illustrating in a striking fashion the degree of adaptation to the peculiar form of food which has taken place in this animal.

The contents of a considerable number of stomachs were examined at different times and were always found to consist of the same kind of material; chiefly shells of various diatoms, masses of brownish oily matter apparently derived from the diatoms, radiolarians, foraminifera, spicules of unrecognized origin, what were probably one-celled algæ, and considerable amounts of sand—about what would be obtained by unselective straining of the water along shore. No food has been seen which appeared to come from the breaking up of larger animals, and indeed it is difficult to see how *Emerita* could do this, in view of the complete absence of chelæ or other grasping organs, and of hard grinding surfaces on any of the mouth parts.

A striking contrast is presented by *Blepharipoda*, where well-developed chelæ are present together with a spiny merus on the third maxillipeds and heavy and well-calcified mandibles of the common type. The antennæ are also much smaller than those of *Emerita*. Unfortunately no fresh specimens were available for the examination of the stomach contents.

RESPIRATION

A number of devices are found in burrowing crabs for the removal from the respiratory stream of particles of sand or mud, which might be harmful to the gills. In some the water is inhaled between the chelipeds and the ciliated pterygostomial region, thus straining out the sediment (*Calappa*,¹³ *Bathynectes*¹⁴). Others, however, have the antennules (*Albunea*¹⁵) or the antennæ (*Corystes*¹⁶) modified to form a tube through which water may be drawn from above the

¹² Trans. Conn. Acad., Vol. 3, p. 338. 1877.

¹³ Garstang, Quart. Journ. Micr. Sci., Vol. 40, p. 212. 1897.

¹⁴ Garstang, Journ. Mar. Biol. Asso., Vol. 4, p. 396. 1897.

¹⁵ Garstang, Quart. Journ. Micr. Sci., Vol. 40, p. 224. 1897.

¹⁶ Garstang, Journ. Mar. Biol. Asso., Vol. 4, p. 224. 1896.

surface of the sand. Garstang (*loc. cit.*) says, "It seems to me not unlikely that further observation of the habits of *Hippa talpoida* [= *Emerita talpoida*] of the American coasts will reveal an essentially similar sieve-like function for the curiously bent and setose second antennæ of that animal". *Emerita*, however, as might be expected, shows a very close correspondence with its congener *Albunea*, the antennules and not the antennæ forming the respiratory tube.

Before considering in detail the mechanism of respiration in *Emerita*, it will be well to describe the animal's normal position in the sand. If a specimen of *Emerita analoga* is placed in a dish containing sand and water it will usually bury itself at once until the rostrum is just below the surface of the sand. Here while the body is concealed, the antennules and slender eye-stalks may be seen projecting above the surface. Occasionally it buries itself more deeply at first, but usually comes to rest in the position described. If the antennules are carefully examined it will be seen that they extend vertically from the sand, the four flagella making the angles of a square prism, while the space between them forms a sort of canal free from sand which is excluded by the interlocking hairs which each flagellum sends out toward its neighbor (figs. 3 and 6, pl. 1). If some powdered carmine or India ink suspended in sea water is allowed to flow from a pipette near the antennular tube, it will usually be drawn down the tube showing an inhalant current. Occasionally the current will be found to set in the opposite direction, and if an animal resting upon the surface of the sand is examined, this will be found to be the normal direction. Here the water is drawn in at the sides of the carapace, as may readily be shown by experiment.

A closer examination shows the presence of very complete channels for the conduction of water to the gills. The single respiratory channel inclosed by the four branches of the antennules turns, at the bases of the latter, ventrally into a chamber inclosed between the bases of the antennæ laterally, the bases of the antennules dorsally, and the expanded ciliated tips of the exognaths of the first and second maxillipeds ventrally. Passing back, the channel is divided by the raised and overhanging apex of the triangular labrum, and now lies to either side, enclosed laterally by the pterygostomial plate and ventrally by the exognath of the first maxilliped. In this canal is found the leaf-like scaphognathite.

The use of such a respiratory apparatus is obvious. While the animal is buried, an adequate supply of water free from sediment may be obtained from above the surface of the sand when the wave

is in, by means of the antennular tube, and then forced out into the surrounding sand. When swimming about or resting on the surface of the sand, the water is taken in at the sides of the carapace and forced out through the antennular tube, the direction of the current thus being that common to most crabs. At other times, possibly when the sand is uncovered, this may also prove to be the more serviceable method. Reversal of current took place in the animals observed in the aquarium at times apparently because of irritation due to the carmine or to stimulation with a pencil point and again without visible cause.

Reversal of current has been described by Garstang in *Corystes*¹⁷ and *Portumnus*¹⁸ and the same thing has recently been observed by us in the case of *Cancer magister*, the common edible crab of the Pacific Coast. It is apparently a much more common phenomenon than is ordinarily supposed.

SUMMARY

The present paper treats of the habits of *Emerita analoga* [= *Hippa analoga*] of the western United States, particularly in regard to burrowing, feeding and respiration.

1. The food of *Emerita analoga* consists of microscopic organisms strained from the waves, to which it is constantly exposed, by means of the greatly developed antennæ. This is shown by examination of stomach contents and observation of living animals under natural conditions.

2. The structure of the peculiar antennæ, the uses of which have hitherto been incorrectly inferred, of the greatly reduced mandibles, and the remainder of the greatly modified mouth parts are remarkably adapted to this form of feeding, and unfitted for any other.

3. The burrowing habits necessitated by their peculiar habitat in the shifting sand within the wash of the waves is accompanied by a large number of adaptive structures, among which are the oval form of the body, the expanded dactyls of the ambulatory legs, and the form and position of the uropods.

4. Respiration, in accordance with their burrowing habits, is carried out by a specialized apparatus similar to that described by Garstang for *Albunea*. Water may be drawn from above the surface of the sand

¹⁷ Journ. Mar. Biol. Asso., Vol. 4, p. 228. 1896.

¹⁸ *Op. cit.*, p. 405.

by a tube formed of the ciliated antennules, and forced out of the gill chamber at the sides of the body, or under other conditions the current may be reversed.

5. There is a constant difference in the size of the male and female; in twenty-seven specimens of each the former averaged 12.4 mm. and the latter 21.4 mm.

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EXPLANATION OF PLATE 1

Emerita analoga (Stimpson)

All figures are from photographs made by the authors of specimens taken at Pacific Grove, California.

FIG. 1. Adult female.

FIG. 2. Adult male. Figures 1 and 2 are from the same negative and show the relative sizes of the two sexes. Slightly less than natural size.

FIG. 3. Adult female, lateral view.

FIG. 4. Adult female, ventral view.

FIG. 5. Antenna from adult female.

FIG. 6. Frontal region of adult female.

FIG. 7. Partially dissected adult female from ventral side.

The operculiform third maxillipeds are turned aside to show the position of the coiled antennæ. Compare with fig. 4. The second and third pereopods have been removed.

ABBREVIATIONS

a1 = first antennæ or antennules.

a2 = second antennæ or antennæ.

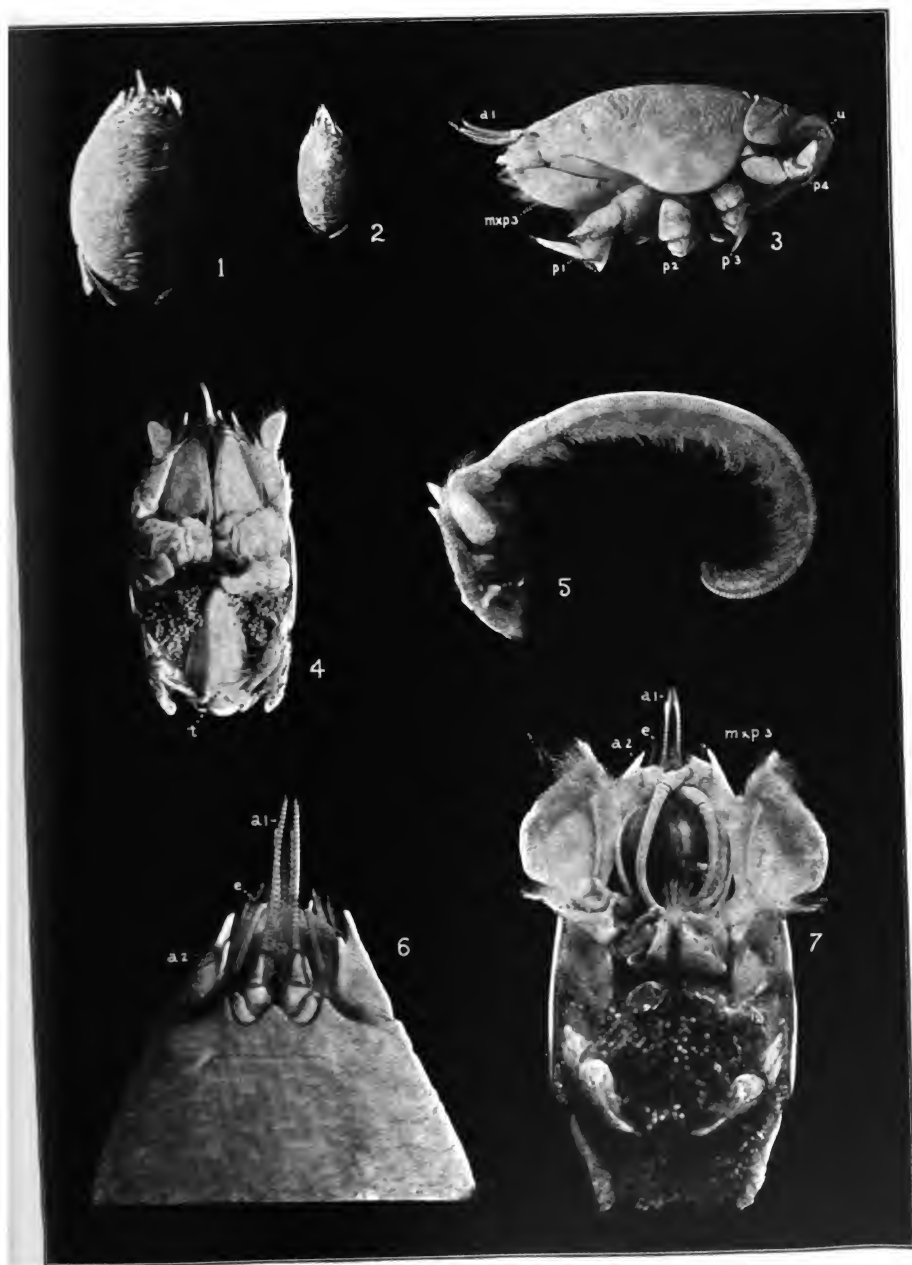
e = eyes.

mxp3 = third maxillipeds.

p1, p2, p3, p4 = first pereopod, etc.

t = telson.

u = uropods.



EMERITA ANALOGA (Stimpson)

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Hamilton Lecture

INFECTION AND RECOVERY FROM INFECTION

WITH FIVE PLATES

BY

SIMON FLEXNER, M. D.



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INFECTION AND RECOVERY FROM INFECTION¹

By SIMON FLEXNER, M. D.

(WITH FIVE PLATES)

MR. SECRETARY, LADIES AND GENTLEMEN: I experience a peculiar pleasure in being chosen to deliver the Hamilton Lecture before the Smithsonian Institution, for, from its beginning, this Institution has been an instrument of catholicity in science, knowing no geographical or national limits and subserving no special department of learning. Its object has been to promote all science. My pleasure is derived from the admission of medicine, so long the healing art, into the body of the exact sciences, into which it has been carried by the discoveries in anatomy, physiology, and pathology of the last decades.

The most notable advances that have thus far been made in the medical sciences relate to the discovery of the class of infectious diseases and the mode of their conquest. Infectious diseases are those diseases that are caused by the entrance into and multiplication within the body of minute, so-called microscopic, parasitic living beings. All animals and plants are subject to disease from this source. Our theme relates to the infectious diseases of the higher animals, and of man in particular, and the biological phenomena involved in recovery from them. Probably the identical or closely similar phenomena account for the recovery from infection of all orders of living beings.

Disease-producing parasites belong to the two great classes of living things; namely, animal and vegetable. The greater number now known are vegetable in nature and are included among the bacteria, but a large number also are animals and of protozoal nature. Just as there are harmless and even useful protozoa that never under any circumstances act as causes of disease, so there are many bacteria of similar innocuous or useful habits.

¹ Lecture delivered at Washington, D. C., February 8, 1912, under the auspices of the Hamilton Fund of the Smithsonian Institution.

In spite of their minute size, these visible parasites possess characters that permit in most instances of their ready identification by the microscope. The small number that lack distinguishing characters of form may be identified by their physiological properties when cultivated in broth or otherwise outside the body; a very few demand for identification the test of disease-producing capacity in animals.

But we are beginning to learn that not all minute organisms can be rendered visible by our most powerful microscopes, and a number of serious diseases of the higher animals, including man, and one disease of plants (the mosaic disease of tobacco) are caused by submicroscopic parasites. It is, indeed, not remarkable that the present microscopes should have failed to define the limits of organized nature. Whether we shall ever invent instruments capable of resolving and rendering visible these minute particles of living matter is a question impossible to answer. Even doubling the potential power of the microscope, by the device of employing for photographic purposes the ultra-violet rays of the spectrum, has failed to bring them into view. Their place in nature is not accurately established. Some, as the parasite causing yellow fever, which passes a stage of its existence in mosquitoes, probably are protozoal; others, as the parasite of pleuropneumonia of cattle, which can be propagated in artificial cultures, probably are bacterial. It can hardly be doubted that they are living organisms, since they are capable of transmission from animal to animal, in which they produce infection, through an indefinite series. The last disease to be discovered to be caused by a submicroscopic parasite is epidemic poliomyelitis, or infantile paralysis. Because the submicroscopic parasites are too small to be retained by, but pass through fine earthenware filters, they have also been termed filterable organisms or viruses. No member of this class of organisms is now known, except such as cause disease.

It is a matter of common knowledge that all individuals of an animal species are not equally subject to disease. This observation can be made on every hand among the human species especially. Careful analysis has indicated that the condition of susceptibility to infection varies not only with the individual but also with the infection itself. Thus measles and small-pox are diseases to which every human being may be regarded as subject, while scarlet fever, diphtheria, epidemic meningitis, and poliomyelitis can claim far fewer victims. So among animals, a certain few diseases secure an almost universal dissemination once they are introduced; while others, the effects of which, after they become established, may be equally or even

more severe, affect far fewer individuals. Beside this fact of varying individual susceptibility within a species is to be placed the highly significant one of racial distinction. All sheep, except the Algerian variety, are subject to anthrax infection; the Maltese goat readily becomes a reservoir of the coccus which it excretes in the milk, and which produces Malta or Mediterranean fever, while other species of goat do not. Certain strains of wheat are not subject to attack by the fungus that readily causes "rust" in other species, and this quality of susceptibility or the reverse is transmitted as a unit character. It is not known whether the phenomenon of susceptibility in animals depends also upon so sharp an hereditary factor.

Infection is an active process quite different from the mere presence upon a surface of the body of the parasite capable of causing disease. We carry constantly upon our skin and mucous membranes a whole host of potentially infectious bacteria which, for the most part, do no harm whatever, and possibly, indeed, through preoccupation of the soil, ward off at times more definitely and highly injurious parasites. And yet they are capable of malign activities. The whole large and important group of pus-producing bacteria are our constant guests, as are quite a number of other species, including the germ that causes pneumonia.

Thus we are obliged to conclude that the surfaces of the body exposed to constant bacterial action possess a high degree of insusceptibility to ordinary infections. This state, about which there can be no question, is spoken of as local immunity. It depends, moreover, on definite factors, some of a relatively coarse kind, that operate only as long as they may be intact, and fail to operate adequately when imperfect. The opening up of "portals of entry," as they are called, of bacteria into the body follows upon the breaking down of this system of external defensive mechanisms. Thus the mucous membrane of the nasal and buccal cavities, especially about the masses of lymphatic tissue called the tonsils, which are imperfectly provided with a complete epithelial investment, particularly in the young, constitutes the gateway into the body of the infectious agents causing diphtheria, measles, scarlet fever, epidemic meningitis, and probably poliomyelitis. These mucous membranes are, obviously, so directly exposed to wide fluctuations of temperature, degree of moisture and dust-content of the air, as to become the common seat of slight pathological conditions that depress their protective powers. That an intact epithelial investment acts as a barrier to certain of these infections is shown by the fact that an

abraded skin surface may be the source of a diphtheric or scarlet fever infection.

The mere presence of highly invasive and infectious bacteria upon a mucous surface is not tantamount to infection. In every epidemic of disease, we either know or have reasons for believing that many more persons carry the germ of the disease than actually come down with it. Thus diphtheria bacilli and meningitis cocci—to mention two examples only—are, during epidemics of their respective affections, found in the throat and nose of many more healthy than diseased persons; and similarly during the prevalence of cholera, dysentery, and typhoid fever, the bacilli causing them are present in the intestinal tract of persons in health. And yet, while these healthy carriers of infection may escape illness altogether, they are often the means of transporting disease to other and susceptible persons who succumb to it.

The reason for this phenomenon is to be sought in an adequate system of external defensive mechanisms in the group resisting infection, and an inadequate system in the other acquiring it. That this is the true explanation is indicated by the effects of indiscretion in diet or the ingestion of irritating substances upon such a potential cholera case, for through these a healthy carrier may be transformed, in a few hours, into a severe and often hopeless case of cholera.

That the broken skin surfaces admit infection is common experience, but luckily the infections thus produced are relatively insignificant. And yet, as the result of injury or a surgical wound, they may be severe. There is, however, no difficulty in following such coarse phenomena as these instances present. It is somewhat more difficult to follow the more remote infections, from this source, that lead finally to tetanus, or lockjaw, or to hydrophobia. In the former, the spores of the tetanus germ, which are enduring and highly resistant bodies, are introduced into the wound with foreign matter—dirt, splinters of wood, wads of paper, etc.—and in the latter, the germ of hydrophobia is injected into the tissues by the bite of a rabid animal. In both instances, the infection develops slowly, often after the original wound is healed and perhaps forgotten. In neither case has the infecting organism power to penetrate the unbroken skin. In both, again, the infection attacks the central nervous system, to which it gains access by travelling along the peripheral nerves; and the seriousness of the respective diseases produced arises from this direct attack upon the important cells of the brain and spinal cord.

The injection of microorganisms into the blood by insects is a more subtle means of causing infection, and it is not only established beyond peradventure, but is of the highest possible significance. It may be stated that this discovery, as much as any other in the whole realm of preventive medicine, has determined the methods, already successfully invoked in many countries, of suppressing highly fatal forms of disease. The range of parasitic causes of disease known to be thus inoculated, as well as the insects that inoculate them, is wide. Mosquitoes carry malaria and yellow fever; biting flies carry trypanosome infections, including the deadly sleeping-sickness; ticks and bed-bugs carry spirochetal infections, including the severe and fatal African tick fever and relapsing fever; body lice carry typhus fever; and fleas carry plague. This list includes all classes of parasitic microorganisms. The protozoa are represented by the malarial parasites and trypanosomes, the bacteria by the plague bacilli, and the submicroscopic organisms by the cause of yellow fever.

Still other factors contribute to determine infection. The period of childhood is especially characterized by a class of infections that depend upon imperfections in the anatomical barriers that are far more adequate in adult life. Many of the diseases that we associate with childhood—measles, scarlet fever, diphtheria, epidemic meningitis, and poliomyelitis, already mentioned—utilize the mucous membranes of the nose and throat to gain a foothold in the body, because they are notably vulnerable. Their crypts or depressions afford a lodging place in which multiplication of the parasites can be effected, and the breaks in the epithelial covering constitute the first breach in the external defenses which the parasites seek to and successfully do enlarge. Tuberculosis of the lymphatic glands of the neck and of the bronchi occurs especially in the young, and also, because of the greater permeability of the corresponding mucous membranes, in children. The intestinal mucous membrane also is permeable to a greater degree for microbes in the young, and thus they are exposed far more than are adults to food infection with the tubercle bacillus. Moreover, the whole group of microbic infections of the stomach and intestines of children, which creates such sad havoc during the warm summer months, depends upon two things; smaller power of excluding germs by their mucous membranes, and a variety of food that is a highly perfect medium for varied microbic growth. In older persons, the incidence of typhoid fever ceases with the anatomical changes coming in the fourth decade of life, that reduce the absorbing power of the intestine for bacteria; while certain par-

asites, such as those causing cholera and dysentery, are not stayed by these conditions, but are themselves capable of producing damage, although being assisted by other injurious agencies.

At first sight, it appears paradoxical that very young infants should show, in view of these facts, a definite resistance to such a disease as measles. But the discrepancy finds an easy explanation in the immunity acquired from the mother, by passive transfer of the protective principles, first from the blood of the mother during pregnancy and later with the milk during nursing. This immunity, being but passive, soon disappears, and the child of a few years then becomes readily infectible. The milk is the one secretion that derives from the blood the immunity principles in large amount, in this differing from all other glandular secretions; and here the coincident permeability of the intestine in the young scores an advantage against the parasites, since they are absorbed from this source into the blood.

Not all parasites of the same species, whether bacterial, protozoal, or submicroscopic, are potentially equal as agents of infection. The quality of virulence, so-called, is of high importance. Not a few of the more common parasites vary greatly in virulence, from degrees that make them almost harmless to degrees that make them almost inconceivably potent. Many millions of non-virulent pneumococci may fail to affect a rabbit, and a single virulent pneumococcus may suffice to produce certain death. This state of virulence is determined in some instances by races of the parasite of particular quality, so that what is virulent for one animal is not necessarily virulent for another. Thus the pneumococcus culture, of which a single germ will set up fatal blood poisoning in the rabbit, may fail utterly, even when many millions are injected, to affect the far smaller guinea pig. Such races of the poliomyelitis virus have now been recognized. The human strain, so called because it is derived originally from human cases of the disease, has at first small power to cause infection in monkeys. By successive transfer from monkey to monkey, certain samples can be made to acquire a prodigious activity for them, due to conversion, by adaptation, into the monkey strain, which there are reasons for believing has now lost power to infect human beings.

These changes take place sometimes slowly and sometimes quickly; in the latter instance, they correspond to or suggest the appearance of "sports" or "mutants" among the higher animals or plants. They have doubtless a definite relation to the prevalence of epidemics of disease, the laws regulating which have still to be worked out. But most epidemic diseases exist at other periods as sporadic dis-

eases; that is, diseases of occasional occurrence. This is true of such epidemic diseases as influenza, meningitis, poliomyelitis, bubonic plague, and many others. But when the particular conditions appear that make possible the transfer of the adapted infectious germs quickly from susceptible individual to susceptible individual, then epidemics tend to arise. The period of this rapid transfer tends to synchronize with certain seasons, so that temperature and other meteorologic conditions play a part, affecting probably the parasites less than the animal host. Thus epidemic meningitis prevails in the winter, doubtless because the nasopharynx is less well defended through the occurrence of colds, etc., than in warm weather. Accidental conditions attending seasons and climates may also play an important rôle in particular epidemics. The recent Manchurian epidemic of plague, which claimed in a few weeks no less than 45,000 victims, was started, doubtless, by infected marmots which were being trapped for their skins; but its spread and conversion into the deadly pneumonic disease was promoted, if not directly caused, by the rigors of the Manchurian winters and the primitive accommodations in railways and inns for the thousands of coolie trappers who were returning southward to their homes. It is a recent and gruesome story how the desperate and panic-stricken coolies, in a fruitless effort to escape death, carried far and wide the highly virulent infection.

At an earlier era, knowing nothing of microscopic life and the essential part it plays in epidemics of disease, and recognizing that these catastrophes were not entirely willful but arose and declined according to some measure of law, physicians imagined a mystical "genus epidemicus" which controlled the visitations of the scourge. Modern science has indeed exorcised this ancient demon; and although it has not yet determined with precision all the elements that enter into the phenomenon of epidemics, it has unravelled them in so far as to indicate that they relate not merely to parasites but even more to the habits and customs, the beliefs and superstitions of peoples, that are often quite as difficult and yet as necessary to alter and improve as it is to overcome the malign propensities of the parasites themselves.

I have indicated that the body possesses remarkable external defensive mechanisms against infection, and, therefore, in order that infection may be accomplished, these defenses must at some point be weakened and destroyed; and I have also sketched some of the means employed to penetrate this armor. It may be illuminating if I now

cite an example, from experimental medicine, to show how important these external defenses are. Epidemic poliomyelitis, or infantile paralysis, is, as far as we know, a disease of human beings exclusively. The evidence available is to the effect that the microbic cause of the disease enters the body by means of the nose and throat and locates in the central nervous organs, where it multiplies and ultimately brings about the tissue changes that account for the paralysis and other symptoms. Of the lower animals, monkeys alone are really susceptible to the disease, but only upon inoculation. They never take the disease spontaneously; that is, they can be exposed to the infection in any degree and yet they remain free from it. But when the cause of the disease, in most minute quantity, is made to pass the external defenses, by being inoculated into the nervous system or into the interior of the nasal mucous membrane, they not only acquire poliomyelitis, but they develop a far severer form than occurs spontaneously in human beings. The deduction from this fact is that monkeys, as compared with human beings, possess a far more efficient system of external mechanisms to exclude the poliomyelitic virus; but human beings, as compared with monkeys, possess a far more efficient internal agency of destruction for the virus, after it has gained access to the interior of the body.

But for the existence of this second line of defenses, the internal, as we may call it, the infected body would be wholly at the mercy of invading parasitic causes of disease. But this second line is, indeed, even more efficient than the first, and of more varied potentialities. It consists of a group of substances contained within the blood, but not produced there, and passing from the blood into the lymph, where they exert influence on the cells composing the organs and upon parasites in the interstices of the tissue. The chief site of the production of these protective and healing principles—immunity principles, so-called—is the very place where the blood corpuscles themselves are formed; namely, in the bone-marrow, spleen, and lymphatic glands. The principles are divisible into two classes of substances: one soluble and dissolved in the fluid plasma, and the other corpuscular and suspended in it. The latter consists of the motile white cells or phagocytes; and together, in virtue of their soluble form and ready motility, they are able quickly to reach most parts of the body where their peculiar properties may be exerted. Not only are these immunity principles preformed in all individuals in whom they operate against intending infections, but they become rapidly increased when infection has been established; and the ultimate issue

of the condition in spontaneous recovery or the reverse depends upon the degree of this response and the competency of the curative bodies evoked to reach and to suppress the infectious agents.

The normal body possesses, therefore, great potential power of resisting infection, and this power can be quickly raised, on demand, to a higher level, so as to ward off disease through a rapid augmentation in the number of circulating white corpuscles or phagocytes, and by means of an increase in the dissolved principles, the purpose of which is to act upon and injure the parasites and to neutralize their toxic or poisonous products. This process is either identical with or closely related to that which takes place during recovery from infection, which consists in the bringing into being of a new set of operations that gradually reinforce the natural resistance—a process termed immunization. The indications of the immune condition are found in the appearance in the blood sometime between the fourth or fifth and the tenth day of the disease, and somewhat later than they have appeared in the spleen and bone-marrow, of highly potent substances that are directed in a specific manner to the direct neutralization of the poisons which have been and are still being produced by the parasites, and to the destruction of the parasites themselves through heightened phagocytosis. As recovery progresses, the soluble immunity principles continue to increase, until, at the termination of the disease, they are present in the blood in quantities that suffice, often, by a passive transfer to another individual, to protect him more certainly from infection or to terminate abruptly an infection already established. If, in imagination, we substitute for man a large animal, such as the horse, and if we conceive the immunization process to be carried forward by design and in a manner to cause the minimum of damage and to produce the maximum of immunity response, we have presented to our mind's eye the principles as well as the method upon which the serum treatment of disease is based.

I should like to emphasize, at this point, the fact that the foundation of the modern specific treatment of infectious disease by serums, by inoculation of dead bacteria, and even by specific chemical compounds, rests upon the working out in laboratories, upon animals and man, of the manner in which spontaneous recovery from disease takes place. I need not remind you that the leading physicians rarely failed to appreciate the unexcelled power of nature to heal her self-inflicted wounds and to recognize that many diseases tend of themselves to progress toward recovery. It has been through imitation of nature's way of curing disease that the efforts at modern control have been forwarded.

With factors so various, it is obvious that conditions which cannot always be followed must make for and against infection. This is the element in the problem that is popularly termed "chance"; and yet this audience need not be told that the term is a mere euphemism for ignorance. Coincidences and probabilities are among the common factors of infection. It is not chance, but ignorance or indifference that carries a free person into a plague infested region; and once there it is fleas and not chance that decide whether he shall or shall not acquire plague. No more is it chance, but only augmented susceptibility, that causes one disease to play into the hands of another, and that decides that the victim of measles, scarlet fever, or small-pox shall succumb to a streptococcal pneumonia or blood infection to which those diseases render him morbidly liable; and no more is it chance that the bearer of a severely damaged heart or kidney or liver shall finally be overcome by a terminal bacterial infection. What the flea has determined for the plague, the diseases predisposing to infection with the pus-producing bacteria accomplish by damaging the body's external and internal defenses against this ubiquitous class of microbic parasites, that ever lurk about seeking opportunity to invade and propagate within the blood and tissues.

So, as we have seen, medicine has advanced from empiricism and become scientific, as chemistry and physics have advanced from alchemy, and astronomy from astrology, and become scientific, by rigid experimental investigation and controlled, logical observation, until now the domain of knowledge is differentiated from the domain of ignorance and superstition by a vigorous body of ascertained truths and established methods of research that rest neither on authority nor opinion. The tangible gains have been such perfected means of combating disease as are represented by the specific serums that have reduced the mortality from diphtheria and epidemic meningitis to one-fourth of the spontaneous recovery rates, the dangers from tetanus and hydrophobia from infected wounds, by means of protective injections, almost to zero, and through preventive inoculation the liability to typhoid fever to a vanishing figure. And thus it has also been achieved that the discovery of specific chemical means of suppressing disease is no longer left to the heart-breaking method of finding useful drugs, in the manner that quinine and mercury were found, by an infinite series of tests upon suffering human beings, based upon pure accident, but by following ascertained clues, first in the laboratory upon the lower animals, until by a process of selection and perfection, such remarkable instruments for the control of serious diseases as salvarsan shall have been evolved.

But the problem is not solved with the discovery of a specific serum or chemical, since these perfected agents must act within the body upon the parasitic causes of disease that seek in different ways to escape their influence. Whether the parasites have a general distribution throughout the blood and tissues, or whether they are confined within a pathological formation in the interior of an important organ or part, and whether they can resist by mutational alterations the action of the curative agents, may be the factors that determine whether the native curative principles or the extraneous ones shall gain access to the seat of disease and bring about their suppression.

In its struggle to survive, the parasite withdraws sometimes into situations to which the curative substances gain access imperfectly and with difficulty. This is the condition present in local infections more or less cut off from the general circulation and from the curative principles purveyed by the blood and met with in the great serous cavities, and especially in the cavity within the membranes that surround the central nervous system. The cerebrospinal fluid is a remarkable liquid that may be regarded as the "lymph" or nutrient medium of the central nervous system; and yet it is almost devoid of protein matter. Now, as it is the protein matter that carries the immunity and healing principles, it follows that the subarachnoid spaces of the central nervous system are dangerously free from them. Moreover, since the anatomical structure decides the quality of the lymphatic fluid in health, it also determines it in disease, and thus it follows that parasites that become localized in the cerebrospinal membranes, for example, are insured a potential advantage against the host. And these general facts are applicable, if in somewhat less degree, to parasites that become established in the cavity about the heart, the lungs, and the abdominal viscera, as well as the spaces about the joints.

Again, certain parasites possess a power of regulation within themselves that serves, often, to protect them from extinction. Under the influence of specific serums or drugs, they undergo a subtle change, probably chiefly of a chemical nature, through which they acquire a capacity of effective resistance to the curative agent. This state is called "fastness" and is regarded as a kind of mutation equivalent to the sudden formation of "sports" and new species among the higher plants and animals. The acquired characters of fastness have been observed to be transmitted by certain orders of parasites through indefinite generations. Our knowledge of this state is derived chiefly from the study of trypanosomes and spiroche-

tal organisms; but it arises among bacteria also. It persists in the protozoal trypanosomes only as long as they continue to multiply asexually in the blood of infected animals, and disappears as soon as the normal state is reestablished, when the organisms multiply sexually, as is their habit, in the body of insect parasites of the host, as, for example, the rat-louse. Bacterial fastness, on the other hand, tends to disappear when these parasites are cultivated artificially outside the body. The particular significance of this resistant state grows out of the circumstance that it is coming to be held accountable for the troublesome or dangerous relapses that occur in many of the infectious diseases.

Manifestly the two factors of location and mutation will determine, in no small degree, the effectiveness of the operation of specific substances for treating disease. When the cause of disease is widely disseminated in the blood, as in malaria, or when it is in the nature of a chemical poison, as in diphtheria, it will obviously readily come under the influence of the curative principles; but when the infecting microorganism takes up a position in the interior of a massive pathological formation, or in the cerebrospinal membranes, for example, the organism will be more difficult to reach and affect. By applying, however, the specific therapeutic agent directly to the seat of the disease, as is being done in the serum treatment of epidemic meningitis, this obstacle to success is being removed.

Bacteriology as a science may be reckoned as dating from the overthrow of the spontaneous generationists and the discovery by Pasteur of the cause of *pébrine* among silkworms. It was quickened into active life and brought down to every-day use, and thus immeasurably extended, by Koch. We are, as it were, still living within the era of its first achievements, and thus we may reasonably hope that this is merely the dawn of its beneficent triumphs.

EXPLANATION OF PLATES

PLATE 1

- FIG. 1. *Bacillus* of typhoid fever. A common rod-shaped bacterial type.
FIG. 2. *Pneumococcus*, the cause of acute pneumonia, mingled with white blood corpuscles (phagocytes). From an infected mouse.

PLATE 2

- FIG. 1. *Meningococcus*, the cause of epidemic cerebrospinal meningitis. It is characteristic of this coccus to be within the white corpuscles or phagocytes.
FIG. 2. *Spirocheta* of African tick fever. In the blood of an infected mouse.

PLATE 3

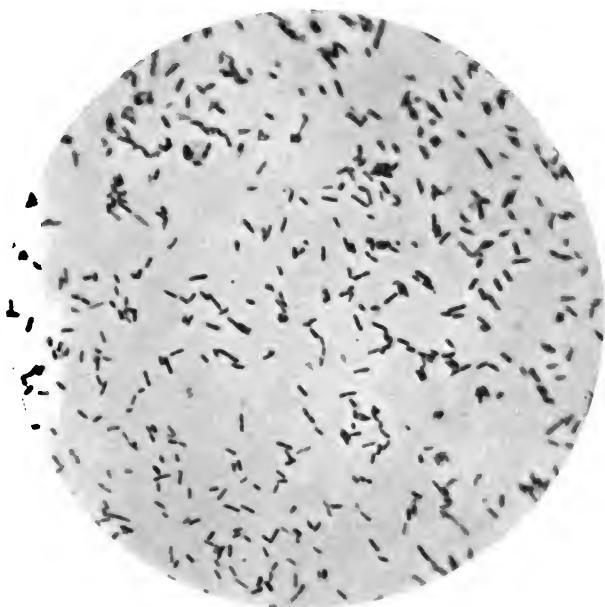
- FIG. 1. Ticks that carry and inoculate the spiral microörganism of African tick fever.
FIG. 2. Tsetse fly that carries and inoculates the trypanosome of sleeping sickness.

PLATE 4

- FIG. 1. Trypanosomes. A protozoal parasite causing diseases of animals and the sleeping sickness of man in the tropics.
FIG. 2. *Spirocheta pallida* in artificial culture. The microörganismal cause of syphilis.

PLATE 5

- FIG. 1. *Spirocheta pallida* in the liver of a new-born infant (diagrammatic). The intimate association of parasites and tissue cells is shown. It is the purpose of a specific curative substance to destroy the former without injuring the latter.
FIG. 2. Chart prepared by Dr. Dunn, of Boston, to show the effect of the antimeningitis serum on the mortality from epidemic meningitis in the Children's Hospital, Boston. The serum treatment was introduced in 1906 at the point indicated by the cross (X).

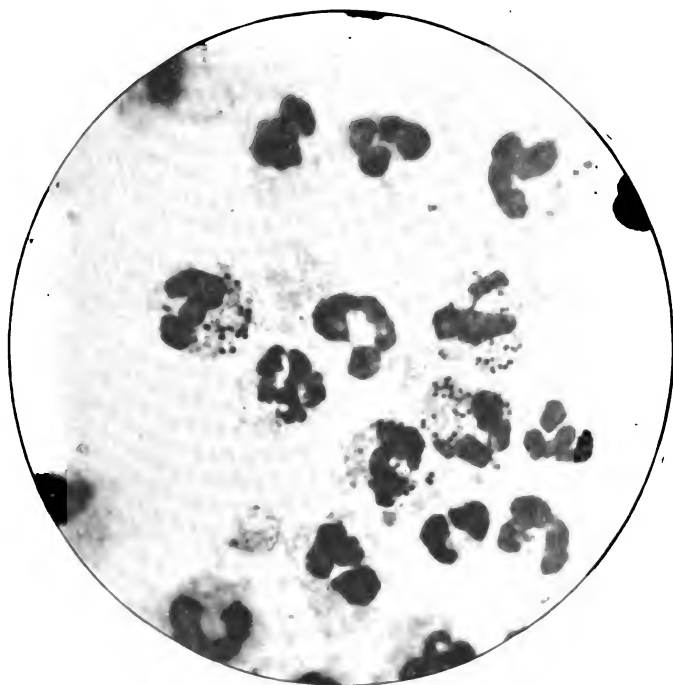


1. BACILLUS OF TYPHOID FEVER

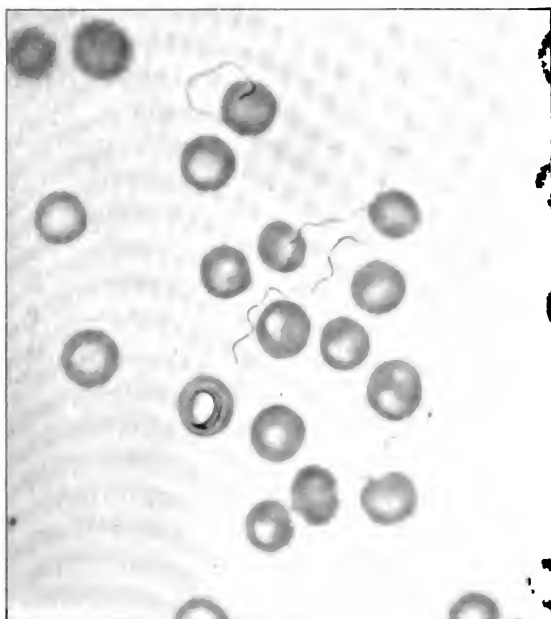


2. PNEUMOCOCCUS AND PHAGOCYTES

SEE EXPLANATION OF PLATE



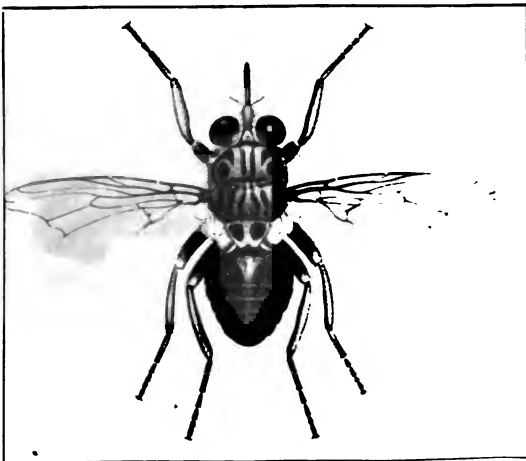
1. MENINGOCOCCUS
SEE EXPLANATION OF PLATE



2. SPIROCHETA OF AFRICAN TICK FEVER, IN BLOOD OF
INFECTED MOUSE



1. TICKS THAT CARRY AND INOCULATE SPIRAL MICROÖRGANISMS
OF AFRICAN TICK FEVER



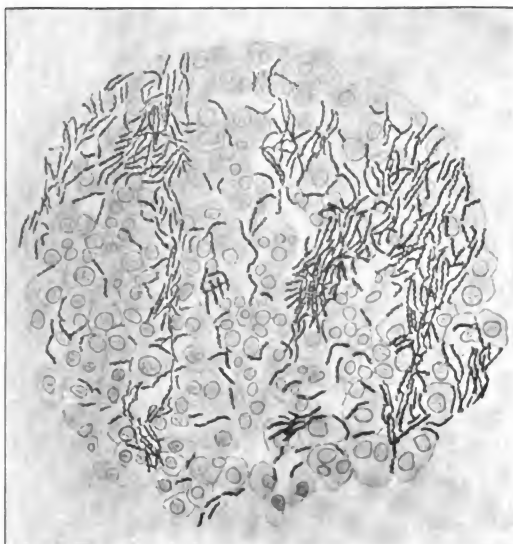
2. A TSETSE FLY THAT CARRIES AND INOCULATES THE
TRYPANOSOME OF SLEEPING SICKNESS



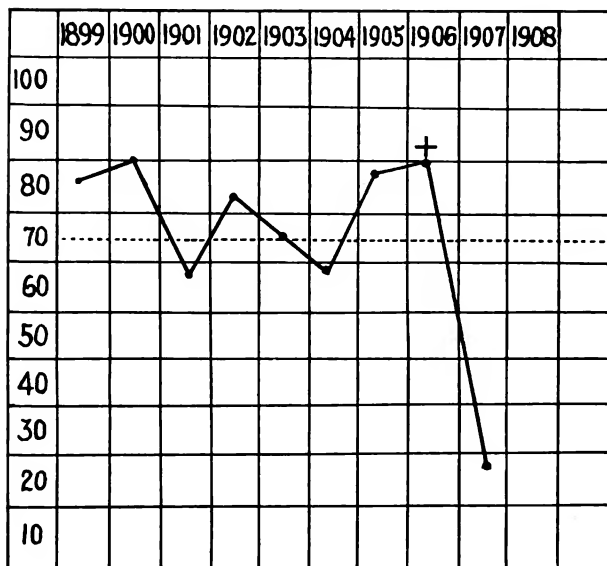
1. TRYPANOSOMES OF SLEEPING SICKNESS
SEE EXPLANATION OF PLATE



2. SPIROCHETA PALLIDA IN ARTIFICIAL CULTURE
SEE EXPLANATION OF PLATE



1. SPIROCHETA PALLIDA IN LIVER OF NEW BORN INFANT
SEE EXPLANATION OF PLATE



2. CHART SHOWING EFFECT OF ANTIMENINGITIS SERUM ON MORTALITY
FROM EPIDEMIC MENINGITIS IN CHILDREN'S HOSPITAL, BOSTON.
SERUM TREATMENT INTRODUCED IN 1906 AT POINT
INDICATED BY CROSS (+)
SEE EXPLANATION OF PLATE

SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 59, NUMBER 9

National Zoölogical Park

NOTES ON ANIMALS NOW, OR RECENTLY, LIVING IN THE NATIONAL ZOÖLOGICAL PARK

WITH ONE PLATE

BY

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National Zoölogical Park

NOTES ON ANIMALS NOW, OR RECENTLY, LIVING IN THE NATIONAL ZOÖLOGICAL PARK

By A. B. BAKER

ASSISTANT SUPERINTENDENT, NATIONAL ZOÖLOGICAL PARK

(WITH ONE PLATE)

The following notes relate to mammals which are rare, or have seldom been kept in confinement, and it is believed that the observations on their characteristics and habits will be of interest.

SOLENOTODON PARADOXUS

Haitian insectivore

During the early summer of 1910, Mr. Franklin Adams, Chief Clerk of the Pan American Union, made a horseback trip through the Dominican Republic, accompanied by his wife. Knowing that the *Solenodon* which inhabits that island is an animal of unusual zoölogical interest, and very sparingly represented in collections, they kept on the lookout for it, making inquiries wherever they went. They were fortunate enough to secure several specimens, two of which they presented alive to the National Zoölogical Park. One of these was the subject of the portrait which is reproduced here.

The animal was very restless when taken away from its regular quarters to be photographed, and in order to secure a picture which would show the characters of the head and feet, it was necessary to confine it in a glass box. The position which was taken under these conditions, and which is shown in the illustration, is not usual, for the tail is but little flexible and is ordinarily carried stiffly, straight out behind and clear of the ground, or used as a prop when the animal rests on its hind feet only.

The illustration (pl. 1, fig. 2) is reproduced as showing especially well the character of the feet of this rather rare insectivore.

LOPHIOMYS IBEANUS

East African rodent

A collection of animals which was received at the National Zoölogical Park in December, 1909, from British East Africa, contained a specimen of *Lophiomys*, of the species later described by Mr. Old-

field Thomas as *L. ibeanus*. As will be seen from the accompanying illustration, the animal is quite different in appearance from the type species, *L. imhausii*, as usually figured. The Park is indebted for the specimen to Mr. G. H. Goldfinch, Assistant Game Warden of British East Africa.

This species of *Lophiomys* occurs in the higher part of British East Africa and is known only to the Wandorobo, a tribe of expert hunters, who explore every corner of the forests. Mr. Goldfinch was well acquainted both with the game of that region and with its animals generally, but this one he knew only from descriptions given by the natives. At his urgent request they secured two specimens in the forest near Nakuru, at about 8000 feet altitude. These he forwarded to Nairobi, whence they were shipped with the collection of animals which had been presented to the Park by Mr. W. N. McMillan of that place. One died at Port Said, while on the way to America, and the other came through safely.

Mr. Goldfinch states that *Lophiomys* is arboreal and lives in the thick forest of the high country, feeding on leaves and tender shoots, also that the natives are averse to handling the animal, believing its bite to be poisonous. It is, he says, "very rare or only got by accident here." In captivity it eats cabbage, sweet potatoes and other vegetables, and is especially fond of sweet potato leaves and the endive salad plant. It is strictly nocturnal, and its slow movements are very suggestive of the Canada porcupine (*Erethizon dorsatus*).

The illustration shows the appearance of the animal when disturbed. It then erects the long hair of its general coat, which parts along either side, leaving there a deep furrow that extends from the base of the ear to the root of the tail. The bottom of the furrow is filled with short and peculiarly modified, spongy hairs. M. Milne-Edwards, in describing the type-species, stated that he did not know of any other mammal with hair of a similar structure. When the animal is quiet the general pelage closes over this band of short hair, entirely concealing it.

URSUS GYAS

Alaskan brown bear

There is so little information available with regard to the rate of growth of wild animals that it seems to be worth while to record the weights of a male Alaska Peninsula brown bear (*Ursus gyas* Merriam) in the National Zoölogical Park, which has been weighed at intervals of about a year for eleven years. The bear was captured near Douglas Settlement at the western entrance to Cook's Inlet,

May 24, 1901, and was then probably about three and a half months old. The weights taken are as follows:

	POUNDS		POUNDS
May 24, 1901	18	March 11, 1907	970
January 4, 1902	180	March 21, 1908	1050
January 15, 1903	450	March 5, 1909	960
January 18, 1904	625	January 20, 1911	1160
January 28, 1905	770	December 13, 1911	1090
February 28, 1906	890		

The bear appeared to be at his greatest weight about December 1, 1910, and would probably have reached or exceeded 1200 pounds at that time, but could not then be weighed.

The decrease shown by the weighing on March 5, 1909, doubtless resulted from extensive "corns" on all four feet and their excision June 15, 1908, which, altogether, crippled the animal for some months.



LOPHIOMYS IBEANUS Thomas



SOLENODON PARADOXUS Brandt

SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 59, NUMBER 10

National Zoölogical Park

FURTHER NOTES ON THE BREEDING OF THE AMERICAN BLACK BEAR IN CAPTIVITY

BY

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National Zoölogical Park

FURTHER NOTES ON THE BREEDING OF THE AMERICAN BLACK BEAR IN CAPTIVITY

By A. B. BAKER

ASSISTANT SUPERINTENDENT, NATIONAL ZÖOLOGICAL PARK

In 1904 the writer published a brief account of the breeding of American black bears at Silver Lake Park, near Akron, Ohio, during a period of 12 years which ended with January, 1903.¹ The breeding of these animals has continued there up to the present time, so that data are now available for a period of 21 years, and it seems worth while to give a further account of the matter, in view of the interest which has recently developed in the breeding of fur-bearing animals.

The place where the bears are kept is a small summer resort. Early in its development a collection of hardy animals was started, with the central feature a "bear pit," and the first bears there were a pair of cubs obtained in 1888, from two different localities near Lake Superior. These bred when three and a half years old and produced their first cub seven months later, on January 23, 1892. Thereafter, the pair had young very regularly, missing only five times in 18 years, with a total of 34, or possibly 35 cubs. Two younger females which were allowed to breed had their first offspring in January, 1902 and 1906. They had produced, up to January, 1912, 10 litters with 22 cubs, and 5 litters with 12 cubs. This gives a total of 68 or 69 cubs in 21 years.

The original pair occupies a circular brick pit 20 feet across and 12 feet deep, which is connected by an underground passage with another similar pit to which the bears can be transferred when necessary. The pits are located in a dry hillside which slopes toward the east. The floor is of terra cotta blocks set in cement, so that the place can be easily washed out with a hose, and this is frequently and thoroughly done. There is also a bathing tank in the pit; and the brick-lined entrance passage, through which access to the pit is

¹ Smithsonian Miscellaneous Collections, Vol. 45, pp. 175-179.

had, can be made into a separate compartment for shutting the bears apart when desired. As more bears were kept, additional accommodations were provided.

An important feature of the bears' quarters is the retiring den, which provides a suitable place for the animal to hibernate. There are two of these connected with each pit and one with the entrance passage. Each den is 5 feet by 6 feet and 4 feet high, lined with brick. They are excavated in the earth, back several feet from the pit, and 8 or 10 feet below the surface of the ground. Each has a small ventilating flue extending to the top of the ground.

The male and female are placed together about June 1, and breed during the last ten days of June and the first week of July. Only one male has been used for breeding, and the younger females which have been bred are offspring of the original pair. In all cases, the first breeding was at three and a half years. Usually all of the breeding bears are together during breeding time, and they are not separated until ready to go into hibernation.

In the fall the bears become very fat. As cold weather approaches, large quantities of dry leaves are thrown into the pit, which the bears carry into the dens. They spend much of their time there, but come out for an occasional meal till the advent of settled cold weather, usually about the middle of December, when they finally retire to the dens for the winter. They generally come out from hibernation early in March. Each female that is expected to have young hibernates by herself: the male and a young female remain together in the pit through the winter.

Mr. W. R. Lodge, manager of Silver Lake Park, states that the bears have always come out, after hibernating for two or three months, in practically as good condition as they went in, not even the females, with cubs a month old or more, showing any thinness. Nor do they appear to be hungry, for at the first meal they take but very little food, putting out the tongue and touching the apple, parsnip or whatever is offered, before biting it; and it is only after three or four days, or even a week, that they eat with the usual appetite.

The young have been born between January 21 and 27, with the exception of two litters, one February 1 and the other a day or two earlier. Their whimpering can be heard through the ventilating shaft, and this at once gives notice of their presence in the den. From the very few which have been examined immediately after birth, it would appear that the weight of new-born cubs ranges be-

tween 9 and 12 ounces. They are plump little fellows, with short velvety hair of a grayish-brown color; their eyes remain closed from 30 to 40 days, and they do not come out of the den until two months old or more.

Each family has its own quarters, though the mothers have shown no inclination to injure each other's cubs when the cubs were playing together on a gate of widely spaced bars which separated them. The male was twice allowed to be with the family for a short time in April and did not injure the cubs, though he carried one about, taking nearly the whole cub into his mouth. During two seasons he was with the mother and cubs from the first of June, but she then failed to have young the next winter. When it is desired to have the mother breed that season, the cubs are taken away in May and raised by hand. Only milk is fed for the first few weeks, after which they are gradually accustomed to the mixed diet of the older bears. The births have been as follows:

Original female, births 1892 to 1909 (no cubs 1910 to 1912) 13 litters, 34 cubs.

2 litters of 1 cub,
3 litters of 2 cubs,
6 litters of 3 cubs,
2 litters of 4 cubs.

Second female, births 1902 to 1912, 10 litters, 22 cubs.

1 litter of 1 cub,
6 litters of 2 cubs,
3 litters of 3 cubs.

Third female, births 1906 to 1911, 5 litters, 12 cubs.

3 litters of 2 cubs,
2 litters of 3 cubs.

This gives 2 litters of 4 cubs, 11 of 3 cubs, 12 of 2 cubs, and 3 litters of 1 cub; but as one of these last was the first litter produced, and the male was with the female at that time, he may have destroyed one or more of the cubs. The two litters of four cubs were from the oldest female, and each followed a year when she had failed to have cubs.

Record of the sexes was kept only for the first 9 litters of the original female, which included 15 males and 6 females.

No cubs have been lost except through accident, and the death of a bear 20 months old was the only one from disease.

The food which is supplied to the bears is a very good approximation to the diet which the animal gets in the wild state. Hotel and

picnic tables of the Park afford a large amount of miscellaneous scraps, to which is added an abundance of green food from farms near by. This begins with dandelion tops in the spring, followed by clover, green corn, watermelons, berries and other fruit. Acorns are gathered for them in the fall and they then get, also, dried sweet corn and "windfall" apples. Occasionally a venturesome hen or pigeon is eaten, but the bears get no other meat except a little that has been cooked.

The time of going into hibernation seems to be determined mainly by the weather, as the bears do not retire to the dens to stay before severely cold weather comes. It happened that the month of December, 1911, was unusually mild, and they did not finally hibernate until the first days of January. However, the bears have uniformly been very fat, and it is probable that, if they were lean, they would not hibernate steadily, but would come out occasionally to seek food. The cubs have hibernated about the same as the older bears.

The surplus bears have been disposed of from time to time, most of them going to animal dealers, when 8 or 10 months old, at \$25 to \$30 each. The highest prices obtained were \$75 for a grown bear and \$50 each, for two cubs. A few were sold for meat when two years old, bringing from \$25 to \$30, with skin and head reserved. For the last eight or ten years, however, there has been sufficient demand for live cubs to take all the surplus, more than a dozen having gone on the vaudeville stage; and there is stated to be a standing offer of \$25 each for future cubs. No skins have been sold.

The value of black bear fur at the present time is about \$25 for No. 1, large northern skins, and 20 to 40 per cent less for those from middle and southern regions. For ladies' wear, prime silky skins of cubs and yearlings are preferred, and these are worth up to \$15. It is a very durable fur.

The Messrs. Lodge, of the Silver Lake Park Company, have been very kind in furnishing information regarding their bears, and this paper is made up almost entirely from data which they supplied.

Both bears of the original pair, now 24 years old, are still in excellent health, although the male does not become as fat in the autumn as he did when younger and the female has had no cubs for the past three years.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 11

EXPEDITIONS ORGANIZED OR PARTICI-
PATED IN BY THE SMITHSONIAN
INSTITUTION IN 1910 AND 1911



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JULY 17, 1912

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LAKE MCARTHUR AND SURROUNDING MOUNTAINS NEAR HECTOR, BRITISH COLUMBIA. SEE PAGE 39



PRESIDENT RANGE, EMERALD LAKE, AND VAN HORN RANGE, NEAR FIELD, BRITISH COLUMBIA. SEE PAGE 44

EXPEDITIONS ORGANIZED OR PARTICIPATED IN BY
THE SMITHSONIAN INSTITUTION
IN 1910 AND 1911.

The Smithsonian Institution has been concerned in numerous scientific expeditions and collecting trips during the last two years. Some of these were new enterprises, while others were for the continuation of work initiated in earlier years. The resources of the Institution not being sufficient to enable it to plan extensive investigations in the field, or to maintain a corps of collectors, it is compelled to concentrate its efforts on special work of limited scope, but of such a character that the results shall, as far as possible, have an immediate bearing on the progress of science. In recent years, as in the whole of its past history, the Institution has had the aid of public-spirited citizens and the coöperation of other institutions and of the several branches of the United States government. It has, in turn, coöperated with other organizations in the explorations which they have conducted, being itself benefited thereby and benefiting those with which it has been associated.

The National Museum has participated in most of these enterprises, sometimes furnishing equipment or supplies, and at other times detailing members of its scientific staff to conduct investigations or to make collections.

In recent years, opportunities have been afforded for participating in exploring and hunting expeditions organized by private enterprise, whereby scientific collections of great importance have been obtained. These collections, with those from other sources, are preserved in the National Museum for exhibition to the public, or for promoting scientific studies.

The field of these activities of the Institution has been world-wide, but in the last two years attention has been concentrated on Africa rather more than on any other region. Scarcely had the Smithsonian African Expedition returned from the field, with its great zoölogical collections, than another opportunity occurred through the generosity of Mr. Paul J. Rainey, of New York, to secure specimens for the National Museum from the same region to supplement and to supply deficiencies in the earlier collection.

MR. PAUL J. RAINEY'S EAST AFRICAN HUNTING-TRIP

Mr. Rainey planned a hunting-trip of several months' duration, the principal object of which was to test the possibility of hunting lions with American bear-hounds. He offered to present to the Institution the natural-history material obtained while he was in the field, provided some person skilled in the preservation of specimens for scientific purposes could be sent with him. The choice fell on Mr. Edmund Heller, who, on account of his extensive experience as one of the field naturalists of the Smithsonian African Expedition, was well fitted to take charge of any zoölogical collections that might be made.

The expedition left New York February 18, 1911, and Mr. Heller turned homeward from Nairobi, British East Africa, about February 15, 1912, so that almost exactly a year was spent in the enterprise. The route of travel was somewhat to the north and east of that taken by the earlier Smithsonian Expedition, and passed through the country lying between the northern part of British East Africa and southern Abyssinia.

Arrived at Mombasa, the expedition took its way toward the north, across the Gabba Plains district, along the east side of the Horerti and Koroli deserts, by the Lorain swamp, and thence along the west side of the desert to Nairobi.

The coast stations of the Uganda railroad were then visited by Mr. Heller, and afterwards various localities about Lake Victoria Nyanza.

The Institution received on September 9, 1911, the first consignment of specimens, consisting of some 300 skins of large mammals, 400 skins of small mammals, and a variety of other zoölogical material. Mr. Heller estimated that the collection as a whole would compare favorably in size with that made by the Smithsonian African Expedition, and that it comprised about 700 skins of large mammals, 4,000 skins of small mammals, together with a large number of birds and reptiles. Most of the material is from regions not covered by the earlier expedition, and some of it is from remote localities never before visited by naturalists.

In the first lot of birds received, was found a new species which has been described by Dr. E. A. Mearns, under the name of Rainey's Wedge-tailed Sunbird. Other novelties will doubtless be found when the whole collection of birds and mammals has been studied.

MR. CHILDS FRICK'S EXPEDITION TO ABYSSINIA AND BRITISH EAST AFRICA

While Mr. Rainey's party was still in the field, another African expedition was organized by Mr. Childs Frick of New York. Mr. Frick's object was to make as complete a collection as possible of the animals of certain parts of Abyssinia and the adjacent territory, including the northern portion of British East Africa, somewhat north of the region traversed by Colonel Roosevelt in 1909-10, and Mr. Rainey's expedition. It is his intention also to visit the neighborhood of Lake Rudolf and to work along the shores of the lake itself, as this region has been but little explored since Count Teleki first visited it in 1888.

Mr. Frick took with him Dr. E. A. Mearns, who had been with the earlier Smithsonian Expedition; also a friend, Mr. Blick, and a physician. From a recent letter written by Dr. Mearns it has been learned that the party proceeded to Aden, and then crossed to Jibuti on the coast of French Somali-Land, whence they proceeded by rail to Dire Daoua in Abyssinia. At this point they left the railroad and followed the road by Herer (or Herrer) to Adis Abeba, the capital of Abyssinia.

Mr. Frick very generously offered to present half the birds collected to the National Museum, and a first consignment comprising several hundred specimens has already been reported by Dr. Mearns as ready for shipment.

SMITHSONIAN ASTROPHYSICAL OBSERVATIONS IN ALGERIA

An African expedition of quite different character was sent out from the Smithsonian Astrophysical Observatory in July, 1911, to Algeria. This was for the purpose of making observations on the radiation of the sun. The party consisted of Mr. C. G. Abbot, Director of the Observatory and Prof. F. P. Brackett of Pomona College. They sailed from New York, taking with them 32 cases of equipment, and on July 25, landed at Algiers where great aid was rendered by Monsieur René L. J. Boisson, Vice-Consul of the United States. Free entry of the equipment was granted by the French government. By the advice of Director Gonnessiat, of the Observatory of Algiers, it was decided to locate on the plateau some 50 to 100 miles directly south of Algiers. Mr. Abbot had the good fortune to meet Director Mestral of the École Roudil, near Ben Chicao, to obtain from him permission to observe from a hill situated about $\frac{1}{4}$ mile east of a little hamlet called Bassour, and to live in a 4-room stone farm-house in

Bassour, belonging to the École Roudil. The observing station was located in latitude $36^{\circ} 13' 20''$ N., longitude $2^{\circ} 51' 30''$ E., at an elevation of 1,160 meters.

With the exception of one French family, all the neighbors during most of the four months' stay were Arabs. A screen-door added to the house by the Americans to hinder the entrance of house-flies, proved to have a no less valuable effect in keeping out uninvited visitors. Ancient methods of agriculture prevail in this region. Wheat is the staple crop. The ploughing is done with wooden



FIG. 1.—Observing station in Bassour. Photograph by Abbot.

ploughs, and the grain is threshed by treading out with oxen or mules, just as probably was done in the same country thousands of years ago.

The ménage for the party was in the hands of Mrs. Abbot, who accompanied her husband, and doubtless owing to this circumstance no sickness of any kind occurred while the observers were in the field.

A complete spectrobolometric outfit was erected, including a small dark-room shelter for the photographic recording galvanometer. This shelter was built by Messrs. Abbot and Brackett out of packing boxes. The apparatus was the same that Mr. Abbot had used in 1909, and 1910, in his brief expeditions to the summit of Mount Whitney,

California (4,420 meters). It is rather a new departure with the bolometer, that delicate instrument which measures the millionth of a degree rise of temperature, to use it out of doors, following the sun in an equatorial telescope, but Mr. Abbot successfully used it so in 1908 at Flint Island in the South Pacific, in 1909 and 1910 at Mount Whitney, and now for several months in 1911 in Algeria.

A delay of about 2 weeks occurred in beginning observations, owing to the miscarriage of one of the cases of apparatus. Considerable cloudy weather unfortunately prevailed in September and October, both at Bassour and at Mount Wilson, California, where Mr. L.



FIG. 2.—Spectrobolometer. Photograph by Abbot.

B. Aldrich was conducting similar observations. Messrs. Abbot and Brackett observed on 44 days at Bassour, and discontinued observing on November 18. Mr. Aldrich observed on 29 of these days at Mount Wilson, and secured observations for about four more which will be useful for the comparison of results between the two stations. It takes about three days of computing to reduce one day's observations, so that the final results of the work are not yet known. If further experiments are necessary, it is hoped to make them at the same stations in June, July, and August of 1912.

Recent experiments of the Smithsonian Astrophysical Observatory made principally at Mount Wilson, California, in the years 1905 to

1910, had strongly indicated that the sun is really a variable star. The fluctuations in the amount of solar radiation seem to be of magnitudes seldom exceeding 5 per cent, but to occur in irregular periods of 5 or 10 days. It is not easy to predict just what effects such changes in solar radiation would produce on terrestrial climate, but that they must have some influence, and quite possibly a notable one, seems highly probable. Hence if the supposed solar changes are real, it will doubtless be necessary for meteorological purposes as well as for general interest to observe the sun regularly at all times of the year, in order to detect and record its variations.



FIG. 3.—Extra observers. Photograph by Abbot.

But before going to the expense of such additional observing equipments as will be necessary for daily measuring the solar radiation, it is indispensable to prove definitely that the sun really varies. While the Mount Wilson work seems to recommend this conclusion very strongly, it is not perhaps impossible that local atmospheric conditions may have had some influence there, so that what seems most likely to have been solar changes may possibly have been of atmospheric origin. To exclude this possibility it is necessary to show that the same results would be reached by simultaneous observations at another station far from Mount Wilson.

The station at Washington is unsuitable for this purpose because clouds so often interfere. A station near the city of Mexico was proposed and would have been occupied in July, but just as definite arrangements were being concluded the town where the expedition was to locate was reported sacked by a war party. As the conditions in Mexico seemed likely to remain disturbed for some time, another part of the world was chosen. Considerations of accessibility, favorable climate, high altitude, and peaceful conditions, seemed to recommend Algeria.

Such of the Algerian observations as have been thus far completely



FIG. 4.—Arab judge. Photograph by Abbot.

reduced seem to be very promising and indicate that the expeditionary measurements were equally as definitive as those made at the permanent station on Mount Wilson. Great confidence is felt, that, as a result of the present expedition, supplemented if necessary by the continuation of it in 1912, a satisfactory conclusion will be reached as to the supposed variability of the sun.

Returning, Mr. Abbot visited Naples, Potsdam, London, and Paris, for the purpose of comparing the silver disk pyrheliometers furnished by the Institution to observers in those cities, with a similar instrument used by the expedition in Algeria. Comparisons were made satis-

factorily in Naples and Potsdam, but clouds prevented them in London and Paris.

INVESTIGATION OF THE ANTIQUITY OF MAN IN SOUTH AMERICA

In March, 1910, Dr. Aleš Hrdlička, Curator of the Division of Physical Anthropology in the National Museum, went to Argentina on behalf of the Institution for the purpose of making an investigation into the question of man's antiquity in that part of the world. A grant was also made to enable Mr. Bailey Willis, of the United States Geological Survey, then proceeding to South America in the interest of the world's topographical map, to coöperate with Doctor Hrdlička, as it was appreciated that the problems to be met with were, to an important degree, of a geological nature. The undertaking was suggested by Mr. William H. Holmes, whose observations during a visit to Argentina in 1908 made apparent the far-reaching importance of the data bearing on human antiquity in South America then being assembled.

The inquiry into man's antiquity in South America dates from the meager reports concerning the scattered remains in the Lagoa Santa caves in Brazil, the casual Seguin finds in the province of Santa Fé, Argentina, and the Moreno collection of old Patagonian material from the valley of the Rio Negro. It has assumed a special importance during the last decade, through a relatively large number of reports by Argentinian investigators (particularly by the late Florentino Ameghino) of new finds of remains of ancient man and of traces of his activities. Some of the more recent finds were so interpreted that, if corroborated, they would have a most important bearing not merely on man's early presence in the South American continent, but on the evolution and the dispersal of mankind in general.

The Smithsonian representatives received from the Argentine government and from scientific men of that country all necessary facilities for the examination of the specimens preserved in various institutions and for the prosecution of their field-work. The late Prof. Florentino Ameghino and his brother, Carlos, gave special aid to the undertaking, accompanying Dr. Hrdlička and Mr. Willis personally for over three weeks along the coast from place to place where the supposedly ancient remains were discovered.

The researches occupied nearly two months. Every specimen relating to ancient man that could still be found was examined and every locality of importance where the finds were made was visited

and investigated. The evidence gathered does not sustain a large part of the claims that have been made. The human bones and the archeological specimens which should represent races geologically ancient agree in all important characteristics with the bones and work of the American Indian; and the finds, so far as observed, while often in close relation with early quaternary or tertiary deposits, are only intrusive. Furthermore, the original sources of some specimens that present certain morphological peculiarities are not so well established that scientific deductions of great consequence can be safely drawn therefrom.

The expedition secured numerous geological, paleontological, and anthropological specimens, some of which throw much light on the question of the antiquity of the finds to which they relate. These specimens are being identified and described in the National Museum, and in due time Dr. Hrdlička and Mr. Willis will present a detailed report on their investigations.

ANTHROPOLOGICAL RESEARCHES AT PACHACAMAC, PERU

Following the researches in Argentina, Dr. Hrdlička visited the great ruins of the temples and city of Pachacamac, about 18 miles



FIG. 5.—View of the Sun Temple, Pachacamac, from northeast.

south of Lima, and also the ruins and cemeteries in the district of Trujillo, Peru, where he collected upward of 3400 crania and a quantity of other skeletal parts. A large percentage of the gathered skulls are free from artificial deformation and therefore afford a much better opportunity than previous collections for a critical study of the peoples who centuries ago occupied and congregated in these regions.

Pachacamac was a religious center, much like the Egyptian Thebes and the Mohammedan Mecca, to which pilgrims flocked from all parts of Peru. After the destruction of the Temple of the Sun by the Spaniards, the place became a desolate pile of ruins with from

60,000 to 80,000 graves of pilgrims who had come from widely separated regions. The valley of Chicama, near Trujillo, with the neighboring country, was the seat of the powerful people known after one of their chiefs as Chimú.



FIG. 6.—View of the southwestern part of Pachacamac, from the north.



FIG. 7.—Figure cast from a mold found in the valley of Chicama, Peru.

As to the importance of the material collected, Dr. Hrdlička remarks:

“Peru may well be regarded, even in its present territorial restrictions, as the main key to the anthropology of South America. Due to the numbers of its ancient inhabitants, and to their far-reaching social differentiations, indicating long occupancy, a good knowledge of the people of Peru from the earliest times is very desirable, and would constitute a solid basis from which

it would be relatively easy to extend anthropological comparison to all the rest of the native peoples of the southern continent. Such anthropological comparisons will be greatly facilitated by the collections acquired on this expedition."

Some of the interesting results of his work are described by Dr. Hrdlička in a pamphlet recently published by the Institution.

THE AZTEC VILLAGE OF XOCHIMILCO IN MEXICO

While returning from his explorations in Peru, Dr. Hrdlička stopped at the City of Mexico and made an interesting trip to an old Aztec village about 15 miles distant, on the shores of Lake Xochimilco, or the "Place of Flowers," one of the few old Aztec towns in existence to-day. The village nestles on the shore of the lake and is inhabited by perhaps a thousand people, mostly Aztecs. It is far surpassed in interest by the lake itself, and the many cultivated islands it contains. The development of these islands is peculiar and unique, and yet is very simple from an engineering point of view. It appears that many years ago some of the early natives conceived the idea of building islands, which they called "chinampas," by sinking bound bundles of reeds so as to form rafts upon which earth and alluvial soil were placed, and on this more bundles of reeds were piled until actual islands began to appear. Sometimes when these islands needed reinforcement to prevent their washing away, or caving in, willows were planted near the shores to form a firm bank and boundary. The islands, of course, gradually sank from year to year, but after being covered over with alternate layers of soil and reeds, a more substantial piece of land was formed, which was capable of cultivation.



FIG. 8.—Clay figure from an old native grave in the valley of Chicama, Peru.

There are many of these artificial islands varying in size from 40 to 120 feet square, planted with flourishing crops of corn, vegetables, and flowers. Altogether, they present a scene of remarkable



FIG. 9.—Artificial islands (Chinampas), Xochimilco, Mexico. Photograph by Hrdlička.



FIG. 10.—Native houses, Xochimilco, Mexico. Photograph by Hrdlička.

beauty and great delight to the visitor, a real earthly paradise. Laid off, as they are, in a regular manner, each an individual blossoming garden, separated from its fellows by canals or water lanes, through which pass the canoes and dugouts of the natives on the way to and

from the market, they have a Venetian appearance that is most attractive.

New islands are constantly being constructed and repaired to-day, just as when the enterprise began years ago. The Aztecs hold the town and lake in their own right. It is not only a thrifty, but a most artistic little settlement, the homes and houses on the shore, the farms and fields in the lake. Corn and all vegetables raised on these island-fields are of the best quality.

In carrying out his anthropological work, Dr. Hrdlička made careful studies of the natives, securing six plaster casts of Aztec heads, one of which was a woman, an excellent type of the modern aborigines.

THE RUINS AT SAN JUAN TEOTIHUACAN IN MEXICO

While in Mexico, Dr. Hrdlička was invited by the government to open a sepulcher at the great ruins of San Juan Teotihuacan, some 25



FIG. 11.—Teotihuacan. View of the Pyramid of the Sun from the north and west before excavation.

miles northeast of Mexico City. These ruins, which comprise two very large pyramids, known as the Pyramid of the Sun and the Pyramid of the Moon, are being cleared and restored by the government with most interesting results. The grave opened by Dr. Hrdlička proved to be one of extraordinary interest. It was situated about 250 yards southeast of the east-southeast corner of the Pyramid



FIG. 12.—View of the Pyramid of the Moon and “road of dead.” Excavated dirt shows entrance to tunnel extending toward interior about 90 feet. This tunnel is cross cut and the right hand cut terminates in a shaft built into the center of the pyramid vertically.



FIG. 13.—Teotihuacan. View from the west of the Pyramid of the Sun after excavation.

of the Sun, and about 20 feet north of the track of the local railroad where there was a large level piece of ground without ruins. The workmen had opened a long exploratory trench through this tract, parallel with the railroad. In an urn-shaped cavity Dr. Hrdlička found the skeletons of a man and a woman, and various dishes, rugs, and knives. The skulls were artificially deformed. These objects were deposited in the museum at San Juan. The interest in this find lies, according to Dr. Hrdlička, in "the peculiar construction of the grave," "the fact that here were buried together an adult man and an adult woman, which suggests the sacrifice of the woman on the occasion of the death of her husband," what appears to be "a clear evidence that the artificial head-deformation of the flathead type was actually practised by at least a part of the ancient inhabitants of these regions," and the evidence that "the ancient builders of Teotihuacan, or, at least, an important part of them, were of the brachycephalic type."

SMITHSONIAN BIOLOGICAL SURVEY OF THE PANAMA CANAL ZONE

The Institution in 1910 organized a biological expedition whose objective point was the Panama Canal Zone. It was undertaken at the urgent solicitation of naturalists at home and abroad, who felt that with the opening of the Panama Canal the natural conditions of the fauna and flora of the land-bridge between North and South America would be disturbed to such a degree as to complicate the problems of geographical distribution in this important region. The means of the Institution were insufficient to permit it to undertake the field-work required, and it was not until they were augmented by the generosity of friends that the expedition could be seriously considered. When this pecuniary aid had been supplemented by the coöperation of the departments of the government, the success of the undertaking was assured.

A letter was addressed to the President outlining the plan, and inquiring whether it would meet his approval if the several executive departments of the government were requested to coöperate in the enterprise. The President gave his approval and authorized the secretary of the Institution to communicate with the departments. All those that were addressed signified their desire to coöperate and assigned experts to aid in the work.

The Institution is indebted to the Department of State, the Department of Agriculture, the Department of Commerce and Labor, and the War Department for courtesies which have made the expedition



FIG. 14.—Choco Indian of Southern Darien, Panama. Photograph by Pittier.



FIG. 15.—Cuna Indian women and children from Urgandi, Coast of San Blas, Panama. Photograph by Pittier.

a success. Special mention should be made of the assistance rendered by the officers of the Isthmian Canal Commission and the Panama Railroad Company, which was extended with much liberality and was of the highest importance in promoting the interests of the undertaking.

The Field Museum of Natural History, Chicago, having planned for the collection and study of the fishes of the Canal Zone, this work was by agreement carried on in conjunction with that of the Smithsonian Expedition.

It was at first proposed to confine the collections to the Canal Zone, but as the natural faunal and floral areas extended much to the north and south, it was found necessary to extend the work into the territory of the Republic of Panama. The government of Panama not only gave the necessary permission, but expressed a strong desire that as much work as possible should be done within its limits, and aided the collectors in every way possible.



FIG. 16.—Tropical thicket, with epiphytic vegetation on Cerro Azul, near Canal Zone. Photograph by Goldman.



FIG. 17.—Party crossing the Savannas northwest of Chepo, Panama, on the way to the mountains at the head of Chagres River. Photograph by Goldman.

The work done in the season of 1910-1911, related to vertebrate animals, land and fresh-water mollusks, and plants, including flowering plants, grasses, and ferns. The work on mammals and birds was carried on by Mr. E. A. Goldman of the Biological Survey of the U. S. Department of Agriculture; on reptiles, batrachians and fishes, by Prof. S. E. Meek of the Field Museum of Natural History, Chicago, and Mr. S. F. Hildebrand of the Bureau of Fisheries of the U. S. Department of Commerce and Labor; on insects, by Messrs. E. A. Schwarz and August Busck of the Bureau of Entomology, U. S. Department of Agriculture; on flowering plants, by Prof. H.



FIG. 18.—Goldman party ascending the bed of a stream on the way into the mountains at the head of the Chagres River, Panama. Photograph by Goldman.

Pittier of the Bureau of Plant Industry, of the same department; on grasses, by Prof. A. S. Hitchcock, of the same bureau; and on ferns, by Mr. W. R. Maxon of the U. S. National Museum.

Mr. Goldman left Washington late in December, 1910, and arrived in the Canal Zone on the 28th of that month. He spent the following six months mainly in the Zone, giving special attention to the Gatun Lake area, where a luxuriant tropical forest will be replaced by a large lake. He reported that great changes, due to flooding, were already observable and that still greater ones were impending. The killing

effect of the water on the standing timber was already very noticeable, most of the trees rotting and falling in a remarkably short time. In March he made a trip to Chepo, some 40 miles to the east of the Canal Zone, and then proceeded overland to the region near the headwaters of the Chagres River where the mountains are about 3000 feet



FIG. 19.—Part of tropical forest being flooded in the Gatun Lake area. This will be entirely submerged when the lake is filled. Photograph by Goldman, 1911.

in height and present conditions not found in the Zone. The summits and northern slopes of the mountains are covered with a rich growth of orchids and plants of the order Bromeliaceæ, which grow both on the ground and on the branches of the trees. The south side of the mountains is covered with a dry forest. In May and June, Mr. Goldman visited Porto Bello on the Caribbean coast of Panama,



FIG. 20.—Boat landing on shore of Gatun Lake, Canal Zone. Photograph by Goldman.



FIG. 21.—Abandoned Lion Hill R. R. Station—the type locality of many species of birds and plants. This part of the railroad will be submerged when Gatun Lake is filled. Photograph by Goldman.

some 22 miles northeast of Colon, where the rainfall exceeds that of any part of the Canal Zone. He crossed the swamps and waded some 10 miles up the Cascajal River to the upper slopes of the Cerro Brujo, at an altitude of about 2,000 feet. As a result of the work over 2,000 birds, nearly 400 mammals, and 160 reptiles and batrachians were obtained, together with numerous photographs and notes on the habits and distribution of various species.



FIG. 22.—Termite nest, near Aguadulce. Photograph by Pittier.

Dr. Meek and Mr. Hildebrand were in the field from January to May, 1911. They occupied themselves principally in collecting the fishes of the fresh waters of the Zone, especially in the Gatun Lake area, and also species of the brackish waters, which it is believed will be among the first to pass through the canal. They also visited the Bayano River on the Pacific side of the Isthmus, about 45 miles to the east of the Canal Zone. A number of species of fresh water

fishes of the Isthmus were originally described from specimens taken in this river. Collections were also made in the Grande River near



FIG. 23.—Across the harbor at Porto Bello. Photograph by Pittier.



FIG. 24.—Chiriqui Volcano. Southernmost peak. Photograph by Pittier.

the Pacific entrance of the Canal, and in the Chorrera River, some 15 miles westward of the town of Panama.

The entomologists, Messrs. Schwarz and Busck, made their headquarters at Paraiso, where the fauna and flora had been but little disturbed by the work on the canal, and besides collecting along the



FIG. 25.—Cavanillesia-tree, a striking feature of the Canal Zone forest.
Photograph by Pittier.

Trinidad River, where they found a rich insect fauna, and in other areas in the Gatun Lake region, they made excursions to Porto Bello and to Nombre de Dios in the Republic of Panama, the latter place

about 35 miles east of Colon. Afterwards they made a trip up the Chagres River, and also to the Island of Taboga in the Bay of Panama, and finally to Cabima, a place on the Pacific side of the Chagres River region.

At the inception of the Smithsonian Biological Survey of the Panama Canal Zone, the botanical part of the investigation was entrusted to Prof. Henry Pittier, of the U. S. Department of Agricul-



FIG. 26.—Tropical jungle, along Panama R. R. Photograph by Hitchcock.

ture, who was detailed for this work by the secretary of that department. Prof. Pittier, who was for many years Director of the Instituto Físico-Geográfico Nacional of Costa Rica, was regarded as peculiarly fitted for this position by reason of his familiarity with the flora of Central America and his wide knowledge of the physiography and plant associations of the region. He left Washington for the Canal Zone in December, 1910, and remained in the field for more than a year. On February 3, 1911, he was joined by Mr. William R. Maxon, of



FIG. 27.—Picachos de Ola (1,969 ft.), in Eastern Veraguas. Photograph by Pittier.



FIG. 28.—Tall grasses, Mindi, Canal Zone. Photograph by Hitchcock.

the Division of Plants in the National Museum, who had been detailed to assist in the work with the main object of collecting ferns and lower cryptogams. Extensive collections were made in the Canal Zone by both these botanists, from Culebra as headquarters along the fifty-mile stretch of the Panama Railroad, various trips being made into the surrounding jungle and forest. Several days were spent also in the region of Porto Bello, on the Atlantic Coast, to the east of the Canal Zone. The most interesting trip undertaken was one of between five and six weeks' duration to the mountain region of Chiriqui, that portion of Panama adjacent to Costa Rica, and a region almost wholly unexplored botanically. The month of March was spent here, with headquarters at the small town of El Boquete which lies at the immediate southern base of the interoceanic divide. From this point several trips were made to the higher peaks, including the ascent of the Chiriqui Volcano, an isolated peak of over 11,000 feet, not previously visited by botanists. The region is especially rich in ferns, and much valuable material was secured, a considerable number of the species being hitherto unreported from Panama.

Mr. Maxon returned to Washington on April 18, accompanied by Prof. Pittier, who returned to Panama about May 1, and continued his investigations there until Feb. 29, 1912.

A large part of the work thus far accomplished has been necessarily of a preliminary character. Enough has been done, however, to indicate very clearly that an adequate investigation of the flora of Panama as a whole must of necessity extend over a period of several years. The reasons for this lie not only in the diversity of the plant associations, but also in the great number of species encountered in most localities and the need of studying many of these (particularly the trees) at different times in order to secure specimens illustrating seasonal changes.

NATURAL HISTORY OBSERVATIONS IN LOWER CALIFORNIA

The National Museum participated in another expedition to Mexican territory in 1911. Beginning in the latter part of the winter of 1910-1911, the Bureau of Fisheries in conjunction with the American Museum of Natural History, which paid a part of the expenses, conducted an exploration along the west coast of Mexico, the steamer *Albatross* being used for the purpose. By invitation, the National Museum detailed two members of its staff to participate in the expedition, Dr. J. N. Rose, Associate Curator of Plants, and Dr. Paul Bartsch, Assistant Curator of Mollusks.

The *Albatross* left San Diego, California, February 28, 1911, visited Guadalupe Island, and then proceeded down the coast of Lower California to the Gulf of California, which was traversed as far north as Angel de la Guarda Island. Dredgings were made off the outer coast of Lower California, both going and returning, and shore and shallow water collecting was carried on in the Gulf. Owing to the short duration of the cruise, somewhat less than two months, it was impossible to make more than a brief stop at any place, but nevertheless, the results of the trip were exceedingly satisfactory. Of marine invertebrates, especially mollusks, a large and fine series was obtained, and of plants, about 2,000 herbarium specimens and 1,000 living specimens, mostly cacti, were secured.¹



FIG. 29.—Dr. Bartsch collecting at low tide in San Francisquito Bay, Lower California. Steamer "Albatross" in distance.

FIELD WORK OF THE BUREAU OF AMERICAN ETHNOLOGY

It would be impossible in this brief review of Smithsonian explorations to summarize the extensive field operations of the Bureau of American Ethnology. This is, indeed, made unnecessary from the fact that they are already mentioned in some detail by the Ethnologist-in-charge, in the reports of the Secretary of the Institution for 1910 and 1911.

Researches were carried on during the year 1910, among the Pueblos, Winnebago, Blackfeet, Northern Cheyenne, Northern Arapaho, Coos, Piegan, and Omaha Indians. Investigations were

¹ (Report U. S. Nat. Mus. for 1911, p. 44.)



FIG. 30.—Cara Cara eagles, and beach vegetation at San Jose del Cabo, Lower California. Photograph by Bartsch.



FIG. 31.—Tree Cacti, a characteristic scene at the head of Concepcion Bay, Lower California. Photograph by Bartsch.

also continued among the Indians of western Pennsylvania, southwestern New York, Montana, and the Rio Grande Valley in New Mexico. Some study was given to the problem of the Indian population, and the special researches in Indian music were continued among the Chippewa.

A certain amount of work in the way of excavation and repair was accomplished at Cliff Palace in southern Colorado, and a study was made of the extensive ruins in the Navajo National Monument, Arizona.

In 1911 field work was conducted by the bureau among the tribes which composed the Creek Confederacy of the southern states; the



FIG. 32.—Removing pottery and other objects from a cemetery within the older part of the ruins. The workmen are San Ildefonso Tewa Indians. Photograph by Hodge.

Tewa Indians of the Rio Grande Valley, New Mexico; the Winnebago Indians of Wisconsin and Nebraska; the Piegan, Blackfeet, Cheyenne, and Menominee Indians of the Algonquian family; the Chippewa Indians, especially with reference to their music; the Osage Indians, now in Oklahoma, and the Iroquois in New York.

In the fall of 1911, Mr. F. W. Hodge, Ethnologist-in-charge of the bureau, represented the Institution in an expedition to New Mexico, conducted under the joint auspices of the bureau and the School of American Archæology at Santa Fé. Early in September Mr. Hodge proceeded to El Morro, or Inscription Rock, in western New Mexico, where, with the assistance of Mr. Jesse L. Nusbaum of

the School of American Archæology, paper impressions and photographs of the inscriptions on the rock were made. El Morro is an enormous sandstone rock rising about 200 feet from the plain, and eroded in such fantastic forms as to give it the appearance of a great castle, hence its Spanish name, El Morro. A small spring formerly existing at the rock made it a convenient camping place for the Spanish explorers of the seventeenth and eighteenth centuries, and the smooth face of "the castle" well adapted it to receive the inscriptions of the conquerors of that early period. The earliest inscription, and historically the most important, is that of Juan de Oñate, colonizer of New Mexico and the founder of the city of Santa Fé in 1606. It



FIG. 33.—Indian taking down specimens from the top of the 1,800-foot mesa.
Photograph by Hodge.

was in this year that Oñate, on his return from a trip to the head of the Gulf of California, visited El Morro and carved this inscription: "Passed by here the officer Don Juan de Oñate from the discovery of the South Sea, April 16, year 1606."

There are nineteen other Spanish inscriptions of almost equal importance, among them that of Don Diego de Vargas, who in 1692 conquered the Pueblo Indians after their rebellion against Spanish authority in 1680. The paper impressions, or "squeezes," have been transferred to the National Museum, where plaster casts have been made of them for permanent preservation.

Although El Morro has been made a National Monument by proclamation of the President, there is no local custodian, and conse-

quently the rock is exposed to vandalism. The inscriptions, so important in relation to the early history of the southwest, are ever threatened with destruction at the hands of thoughtless visitors who scratch their own names in dangerous proximity to these old records of early exploration.

Mr. Hodge later joined Dr. Edgar L. Hewett, director of the School of American Archæology, on an expedition to the Jemez valley, about 65 miles northwest of Albuquerque, where excavations were



FIG. 34.—El Morro, Inscription Rock in western New Mexico.

conducted in the ruins of a large stone pueblo known as Kwasteyukwa, which measures about 1,100 feet by 600 feet, and is situated on a mesa rising 1,800 feet above Jemez River. This pueblo was evidently contemporary with Amoxiumqua, which was occupied from prehistoric times to the year 1622, when it was abandoned on account of the depredations of the Navajo Indians. Seven years later Amoxiumqua was rebuilt and re-occupied at the instance of a Franciscan missionary and remained inhabited for some time prior to 1680 when it was permanently abandoned.

Excavations, chiefly in the refuse heaps which formed the cemeteries of Kwasteyukwa, brought to light about 125 skeletons and more

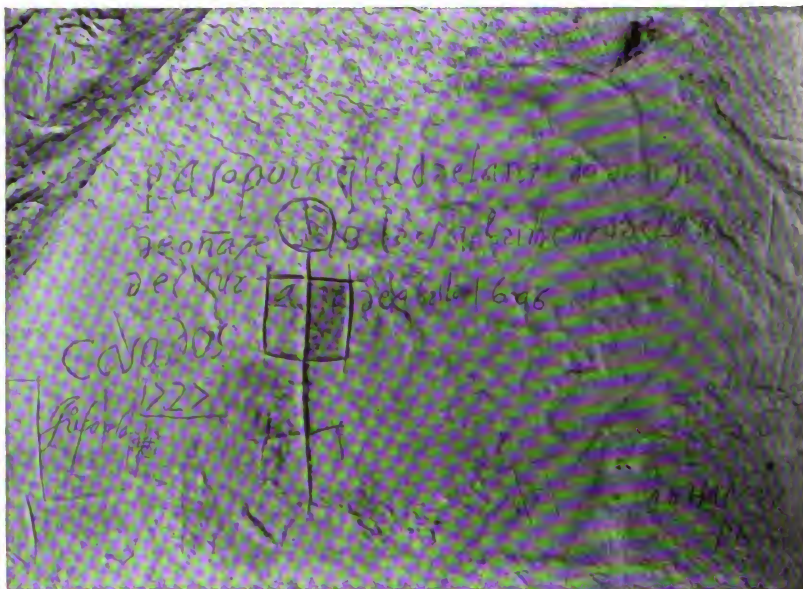


FIG. 35.—Inscription at El Morro: "Passed by here the (officer) Don Juan de Oñate from the discovery of the South Sea, April 16, year 1606." Photograph by Hodge.

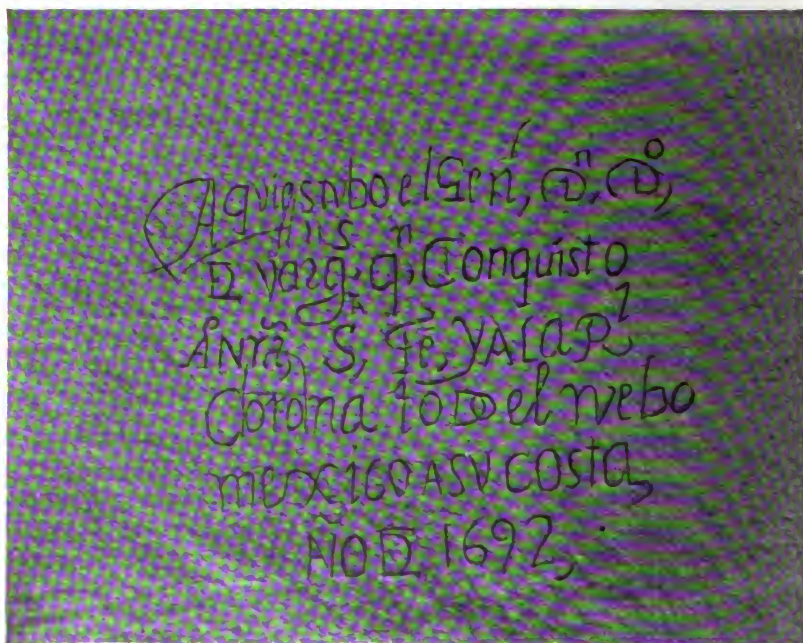


FIG. 36.—Inscription at El Morro: "Here was the General Don Diego de Vargas, who conquered for our holy faith, and for the Royal Crown, all of New Mexico, at his (own) expense. Year of 1692." Photograph by Hodge.

than 200 vessels of pottery, mainly in fragments because the occupants had the custom of "killing" the vessels deposited with the dead by



FIG. 37.—Debris of the walls of the great pueblo of Kwasteyukwa, New Mexico. Photograph by Hodge.



FIG. 38.—The excavation camp at Kwasteyukwa, New Mexico. Photograph by Hodge.

heaping large stones upon them. All the fragments were carefully preserved, however, and are now in the National Museum, where

they will be repaired and made available for exhibition and study. Most of the pottery bears decorations in color, and some of it shows close relationship to pottery found in ancient Hopi ruins of north-eastern Arizona. Studies by the Bureau of American Ethnology among the Indians of the latter region show that some of their clans came from the Jemez country, and the archeological studies in the Jemez valley likewise show early connection between the occupants of these two areas. In addition to the pottery, numerous objects of bone, stone, and shell were found. Among the most significant of the finds are the remains of a necklace, accompanying the skeleton of a child, consisting of 24 Venetian glass beads, substantiating the conclusion that Kwasteyukwa was contemporary with Amoxiumqua, which latter village, according to early Spanish records, was occupied within the historical period.

A VISIT TO THE PETRIFIED FOREST OF ARIZONA

In the spring of 1911, Dr. George P. Merrill, Head Curator of Geology in the National Museum, was detailed, at the request of the Secretary of the Interior, to visit the Petrified Forest of Arizona for the purpose of selecting certain areas of the reservation from which schools, colleges, and scientific institutions might collect specimens under permits from the Interior Department, in accordance with the Act of Congress for the Preservation of American Antiquities, approved June 8, 1906.

The Petrified Forest is a government reservation of eighty square miles, containing fossilized trees and wood of great scientific interest. The nearest town is Holbrook, while just on the outskirts of the forest is the hamlet of Adama. The fossilized trees and other remarkable features of the reservation have proved a great attraction to visitors, but heretofore no collecting has been permitted, for an indiscriminate removal of specimens would have wrought great injury to this remarkable work of nature. It is believed, however, that after a careful examination of the forest it will be possible to set aside certain areas from which duly authorized institutions may be permitted to make collections for scientific and educational purposes, without detriment to the forest as a whole.

BIRD STUDIES IN THE ALEUTIAN ISLANDS

Some two or three years ago, Mr. A. C. Bent, of Taunton, Massachusetts, undertook the task of completing the work on the life-histories of North American birds, which was originally projected by



FIG. 39.—Gulls on nests. Photograph by Bent.



FIG. 40.—Pallas's Murres on Bogoslof Island. Photograph by Bent, July 4, 1911.

the late Major Charles Bendire. Two volumes of this work, prepared by Major Bendire, have already been published by the National Museum and Smithsonian Institution. In order to obtain the necessary data to finish this comprehensive treatise, Mr. Bent intends to make a number of excursions to various out-of-the-way parts of North America where birds can be observed on their breeding-grounds.



FIG. 41.—Pallas's Murres on Bogoslof Island. Photograph by Bent, July 4, 1911.

In this connection a small party of naturalists made a brief visit to the Aleutian Islands and Bering Sea during the season of 1911, chiefly in the interests of the Smithsonian Institution and the Biological Survey of the Department of Agriculture, and especially to make a study of land and marine birds. Through the coöperation of the Treasury Department, the party was afforded transportation on the revenue cutter *Tahoma*. The party consisted of Messrs. A. C. Bent; Rollo H. Beck, of San José, California; Alexander Wetmore, of Lawrence, Kansas; and Fred B. McKechnie, of Boston, Mass.

Mr. Bent remarks in his report that the party sailed from Seattle, Washington, on May 19, and took the inside passage north to Ketchikan, where they remained a few days, and from there they sailed out through Dixon Entrance and nearly west across the Pacific Ocean to Unimak Pass. They entered the pass on June 4, anchored for one night at Akun Island, and reached Unalaska on June 5. After discharging the cargo and coaling, they started on the western trip among the Aleutian Islands on June 10, with orders for the *Tahoma* to return to Unalaska on July 1. This gave the party less than three



FIG. 42.—Red-faced Cormorants on Walrus Island. Photograph by Bent, July 7, 1911.

weeks in which to explore over 800 miles of difficult islands, an undertaking for which three months would have been hardly time enough. The expedition cruised the whole length of the chain, however, and landed on Atka, Kiska, Attu, Tanaga, and Adak islands, besides visiting the western end of Unalaska Island, landing at Chernofski.

The reconnaissance of the Aleutian chain was necessarily so superficial and hurried that merely a brief report of the results has yet been made, a full description of the topography and the flora and fauna being reserved until a more complete biological survey can be under-

taken by some subsequent expedition. However, in spite of the short time at their disposal, the four members of the party used the excellent facilities at their command to the best advantage, and by constant hard work accomplished very satisfactory results. The officers of the *Tahoma* gave the party very valuable assistance and did everything in their power to further the objects of the expedition, especially Chief Engineer John I. Bryan, Lieutenant John T. Carr, Lieutenant Herbert N. Perham, and Doctor Louis Schwartz.

Some good series of land birds were collected on nearly all of the



FIG. 43.—California Murres on Walrus Island. Photograph by Bent, July 7, 1911.

islands visited, including a particularly fine series of the various subspecies of ptarmigan, among which a new species was discovered. This new form inhabits Tanaga Island.

Various interesting facts were learned regarding the distribution and habits of the birds of this region, but so much important work in this line still remains to be done, that further and more thorough explorations would well be worth while.

On returning to Unalaska on July 1, the party was informed by the Commander of the Bering Sea fleet, that the Revenue Cutter Service could do no more for them, as the *Tahoma* was needed on the

seal-island patrol. Therefore other arrangements were made for transportation during the remainder of the season. Mr. Wetmore went to Unalaska to work in that vicinity for a while and to secure passage homeward along the south side of the Alaska Peninsula. The results of his work, however, belong to the Biological Survey. The remainder of the party secured passage to Nome on the gasolene schooner *Polar Bear*, owned and commanded by Mr. Louis L. Lane, of Seattle. They sailed from Unalaska on July 3, and reached Nome July 11, having spent one day on Bogoslof Volcano, half a day on St. Paul Island, half a day at Walrus and a day at St. Matthew and Hall islands.

No thorough work could be done on such a hurried trip, but a fairly good impression was obtained of the avifauna of these interesting islands and a large series of photographs taken.

Although the Murre colonies at Bogoslof Island were the most extensive seen and probably included the greatest number of birds, they were totally eclipsed in density by the wonderful colonies on Walrus Island. This is a most remarkable little island, an ornithological wonderland, where ten species of seabirds breed in countless multitudes. The California Murres rank first in number, literally covering the low cliffs and rocky shores all around the island, as well as large spaces on top of it, with dense masses of birds sitting close together.

STUDIES IN CAMBRIAN GEOLOGY AND PALEONTOLOGY IN THE CANADIAN ROCKIES

During the field season in 1909, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, continued his investigations in the geology of the Cambrian and pre-Cambrian rocks of the Bow River Valley, Alberta, Canada, and on the west side of the Continental Divide north of the Canadian Pacific Railway in British Columbia.

The first camp was made on the shores of Lake Louise, southwest of Laggan. From this point work was carried forward on the high mountains east, northeast, and southwest of the lake, and side trips were made to the Valley of the Ten Peaks and across the Bow Valley in the vicinity of Ptarmigan Lake. Many fine photographs were secured, both of the beautiful scenery and of the geological sections which are wonderfully well shown above timber line on the higher ridges and peaks.

The measurements of the Cambrian section were carried down to a massive conglomerate which forms the base of the Cambrian



FIG. 44.—Vice-President Peak with Vice-President Glacier in the foreground, taken with 24-in. lens from a point on the soil-covered moraine on the north slope of a terrace at the foot of Vice President Peak, 7 miles north-northeast, in an air line, from Field, British Columbia. Photograph by Walcott.

system in this portion of the Rocky Mountains. This discovery led to the study of the pre-Cambrian rocks of the Bow River Valley. These were found to form a series of sandstones and shales some 4000 feet in thickness, that appear to have been deposited in fresh-water lakes prior to the incursion of the marine waters in which the great bed of conglomerate and the Cambrian rocks above were deposited.

Completing the reconnaissance survey of the Bow River area,



FIG. 45.—Northern end of fossil quarry in Middle Cambrian Burgess shale about 700 feet above Burgess Pass trail on ridge between Mount Wapta and Mount Field, about 8 miles from Field, British Columbia. Photograph by Walcott.

camp was moved to the Yoho River Canyon. In this canyon, one of the most picturesque and instructive areas in the great Yoho National Park of Canada, a study was made of the north side of the President Range and numerous pictures were taken in that vicinity, as well as from Burgess Pass, north of Field.

A most interesting discovery of unique Cambrian fossils was made near Burgess Pass and a number of specimens collected before the snow drove the party back to Field. Three days were then spent on Mount Stephen, at the famous trilobite beds, before breaking up camp on September 8, 1909.

When opportunity offered during the fall and winter, field notes were written up and studies made of the sections obtained during the summer. As the results of these studies two papers were issued in the Smithsonian Miscellaneous Collections, Volume 53: No. 6, Publication 1934, "Olenellus and other Genera of the Mesonacidæ," and No. 7, Publication 1939, "Pre-Cambrian Rocks of the Bow River Valley, Alberta, Canada." Preliminary studies were also made of the unique crustacean fauna found in the Middle Cambrian rocks of Burgess Pass.



FIG. 46.—Mountain showing folding of Upper Cambrian rocks on northwest side of Amiskwi Pass. Photograph by Walcott.

In the field season of 1910, the secretary continued the study of the Cambrian strata of the section of the Rocky Mountains adjacent to the main line of the Canadian Pacific Railway, special attention being given to the Stephen formation. The outcrop of this formation was carefully examined for many miles along the mountain sides, with the hope of finding a locality where conditions had been favorable for the preservation of the life of that epoch. The famous trilobite locality on the slope of Mount Stephen above Field had long been known and many species of fossils collected from it, but even there the conditions

had not been favorable for the presence and preservation of examples of much of the life which, from what was known of older faunas and the advanced stage of development of the Upper Cambrian fauna, must have existed in the Middle Cambrian seas. During the season of 1909, the finding of a block of fossiliferous siliceous shale which had been brought down by a snowslide on the slope between Mount Field and Mount Wapta, led the secretary to make a thorough examination of the section above it in 1910. Every layer of limestone and shale was examined, until the fossil-bearing band was finally located. After



FIG. 47.—View looking out of a glacial cirque in the Van Horne Range, British Columbia. These abandoned cirques are very common in the Canadian Rockies where they are frequently occupied by shallow lakes and snow banks, like those in the immediate foreground. Photograph by Burling.

that, for 30 days the shale was quarried, slid down the mountain side in blocks to a trail, whence it was transported to camp on pack horses, where the shale was split, trimmed, and packed and then taken down to the railway station at Field, 3,000 feet below.

A number of sections of the Cambrian rocks were studied and measured in the mountains north and south of Laggan, Alberta, and many beautiful panoramic photographs secured.

Most of the field season of 1911 was spent in a continuation of the work of 1910 upon the fossil bed between Mount Field and Wapta Peak. Camp was established and a trail built to the fossil quarry in the shale 800 feet above. The secretary, with his assistants, continued collecting as in 1910. This was a more or less tedious task, the monotony of which was relieved by the occasional discovery of a prize specimen, the exploding of a charge of dynamite, the passing of

a party of tourists on the trail seven hundred feet below, or by sudden showers and snow flurries. In September a start was made for the Amiskwi Pass region northwest of Field. Rain, followed by snow, met the party on the pass. On September 22, the snow was so deep that the wild animals had left the higher canyons and ridges, and the party reluctantly retreated to Field, to meet there a snow storm that closed all field work for the season of 1911.



FIG. 48.—Mr. Burling packing fossils at Glenogle, B. C.

Mr. L. D. Burling spent the summer of 1910 in the collection of fossils and in the study of the stratigraphy of a portion of the rocks in the Yellowstone National Park and in the Big Horn and Wind River Mountains of Wyoming. The sections measured were found to be essentially identical with each other and much similar to those of Colorado. The chief purpose of the work was the correlation and

proper interpretation of the lower Ordovician fossil fish horizons. A short visit was made to the type localities in the vicinity of Manitou and Cañon City, Colorado, and several hundred pounds of fossils were added to the collections. The latter part of August and the early part of September 1911 were spent in the study of the Lower Paleozoic rocks of the Van Horne Range and at places along the line of the Canadian Pacific Railway west of Field, principally at Glenogle.

Quite an interesting and extensive series of Ordovician and Silurian fossils were collected at the town of Stony Mountain, about 15 miles from Winnipeg, Manitoba.

The Canadian Pacific Railway near Glenogle was such "good going" that the fossils were carried in hundred-pound lots. The hunting coat as well as the knapsack (fig. 48) are filled with rocks which are crowded with the fossil remains of minute and ancient animals.

BIOLOGICAL SURVEY OF THE MOUNT ROBSON REGION IN THE CANADIAN ROCKIES

Through the courtesy of the Canadian Government and of Dr. A. O. Wheeler, president of the Alpine Club of Canada, the Smith-



FIG. 49.—Mount Robson, British Columbia. Photograph by Hollister, 1911.

sonian Institution was enabled, in the summer of 1911, to send a small party of naturalists to accompany Dr. Wheeler on his topographical survey of the British Columbia and Alberta boundary line and the Mount Robson region. The party started in June, and returned in October, 1911.

Mr. N. Hollister, of the United States National Museum, naturalist in charge of the party, reported on his return the expedition had been very successful in obtaining a fairly complete collection, covering practically all the birds and mammals inhabiting this previously unworked territory, together with many insects and botanical specimens. The party of naturalists consisted of four members,

including Mr. Hollister, and Mr. J. H. Riley of the Division of Birds in the National Museum. Assembling at Edmonton, Alberta, Canada, early in July, 1911, they proceeded on the Grand Trunk Railroad to the end of the line where they took pack horses and penetrated the Mount Robson region. The land surveyed included the territory lying about this mountain in the heart of the Canadian Rockies, comprising the most rugged and broken country imaginable. Amid this wonderful scenery Mount Robson rises in titanic outline, the highest peak in Canada, probably between 14,500 and 15,000 feet high, and surrounding it for a distance of 50 miles in all directions lies the field of the survey. In this wild and unclaimed country the party of naturalists remained nearly four months, protected by special permits from the Canadian government. The natural history work was divided up, Mr. Hollister and Mr. Riley collecting the birds and small mammals, while the other two collectors hunted big game. The collection includes some 900 specimens of birds and mammals, the latter being of all kinds from tiny shrews to caribou and bears. One enormous grizzly bear was obtained by a fortunate shot. Much fine material for exhibition groups was secured, including a series of caribou, mountain goats, mountain sheep, beavers, and many varieties of smaller animals. As already mentioned, large numbers of plants and insects were also collected. All this material was turned over to the National Museum.

INVESTIGATIONS OF MAINE SHELL-HEAPS

While the above explorations were being carried on in various regions, a number of minor investigations were undertaken along the Atlantic seaboard. One of these had for its purpose the assembling of animal remains from the shell-heaps of the Maine coast, eastward from Penobscot Bay, in order to ascertain whether the fauna at the time the heaps were accumulating was different from that now existing in the same region, a question which seemed to demand attention from the fact that an extinct species of mink had been found in some of the heaps. The work was carried on by Dr. F. W. True in the summer of 1910, in continuation of investigations of preceding years, the field of operations extending from Sargentville, opposite Deer Isle, to Harriman's Point in Bluehill Bay. Large numbers of bones and teeth of mammals and other vertebrates were obtained, as well as fragments of pottery and other objects of human workmanship. A part of this territory was explored some years ago by Major J. W. Powell and Mr. Frank H. Cushing of the Bureau



FIG. 50.—An Indian shell-heap on Herrick's Bay, Hancock County, Maine.
Photograph by True.



FIG. 51.—A bluff on Herrick's Bay, Hancock County, Maine, on which the shell-heap shown in Fig. 50 is located. Photograph by True.

of American Ethnology, and the collections which they made, as well as the later ones, are preserved in the National Museum. While remains of the extinct species of mink were abundant in the shell heaps referred to, and have also been obtained from heaps on the



FIG. 52.—Naskeag Point, Hancock County, Maine, looking from the Indian shell-heap on the shore. Photograph by True.

shores of Casco Bay, the fauna as a whole was found to correspond to that now existing in the region.

EXPERIMENTS ON MARINE WORMS AT WOODS HOLE, MASSACHUSETTS

During the summer of 1911, Dr. J. E. Benedict, Chief of Exhibits of the Department of Biology in the National Museum, made some interesting experiments at Woods Hole, Mass., in preparing specimens of marine worms and some other invertebrates in such a manner that they would aid in interpreting the fossil forms obtained by Dr. Walcott in the Cambrian strata of British Columbia. By submitting the specimens to pressure and afterwards casting them in plaster, some data were obtained which serve to explain peculiarities found in the fossils.

STUDIES OF THE FISHES OF THE DISTRICT OF COLUMBIA

For a year or more, Messrs. B. A. Bean and A. C. Weed of the Division of Fishes in the National Museum, have availed themselves



FIG. 53.—Pool near Chain Bridge, containing many Black Bass and other fish, connected with the Potomac only in very high water. Photograph by Weed.



FIG. 54.—Trammel's Pond, one-fourth mile from Potomac River and one-half mile from Difficult Run. This pond is nearly alive with elusive Black Bass. Photograph by Weed.

of such opportunities as occurred to collect specimens of the fishes of the District of Columbia for a special faunal exhibit in the Museum,



FIG. 55.—Lower end of Little Falls, D. C. Snagging for herring. Photograph by Weed.



FIG. 56.—Seine haul at Ferry Landing fishing shore, Va. Shad and herring. Photograph by Weed.

and also to add to the knowledge of the distribution and habits of the various species. The fauna of each of the several classes of

waters, river, lowland streams, creeks, upland brooks, and pools, was investigated, and much new information was obtained regarding the forms living in the different environments, while the list of species was considerably augmented, the whole number known being ninety-three.

COLLECTING BIRDS IN SOUTH CAROLINA

On April 15, 1911, three members of the Museum staff from the Division of Birds, Dr. Edgar A. Mearns, Mr. J. H. Riley, and Mr. E. J. Brown, made a trip at their own expense, to South Carolina for the purpose of collecting birds for the National Museum, from the neighborhood of Christ's Church Parish, in Charleston County. This county abounds in birds and is of much interest to ornithologists from the fact that it was here that Audubon and Bachman made collections in 1831 and 1832. Messrs. Brown, Mearns, and Riley obtained some 600 specimens, including some 50 prototypes out of 72 which are described from this locality. Among them were many water-birds not previously in the Museum collections, and also warblers, plovers, curlews, Mississippi Hites, etc. Some reptiles (including a coral snake), were also collected by the party which was in the field about five weeks. Dr. Mearns remained in the field a week longer, and collected many plants for the Museum.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 12

SAWFLIES FROM PANAMA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES

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(PUBLICATION 2088)

CITY OF WASHINGTON
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SAWFLIES FROM PANAMA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES¹

By S. A. ROHWER

The following report of the Chalastogastra (sawflies) collected by Mr. August Busck on the Smithsonian Biological Survey of the Panama Canal Zone in the year 1911, has been prepared in the Branch of Forest Insects of the Bureau of Entomology, U. S. Department of Agriculture. Although the collection made by Mr. Busck is small there are some interesting species, *Acorduloceridea compressicornis* being the most remarkable one of the lot. *Ptilia lautiformis* and *Stromboceridea maculipennis* are nearly identical in color, yet belong to widely separated families. This identity in coloration in the Neotropical region is often repeated in well separated groups of Chalastogastra; and often a number of species of one genus may be colored almost the same. As a rule the Neotropical sawflies are quite different both in color and structure from the Nearctic, and in some subfamilies resemble more closely the species of the Oriental region than any other. It would seem, in the Selandriinæ, that the species of the Neotropical and Oriental regions have developed along the same lines, perhaps due to the southern extension of the Holarctic types into a warm region.

CALOPTILIA NIGROSTOMA, new species

Differs from *Caloptilia nigriceps* (Cameron) and *C. nubeculosa* (Konow) (*C. vitreata* Konow is probably the male) by the black mouth as well as other characters.

Female.—Length 7.5 mm. Labrum depressed apically, the anterior margin broadly rounded; apical margin of the clypeus depressed; transverse clypeal carina triangulate; median carina strong; middle fovea triangular in outline, dorsal wall rounded; ocellar basin pentagonal; antennal foveæ very large, extending up to the level of anterior ocellus; postocellar area about twice as wide as long, poorly defined; stigma scarcely tapering, nearly parallel-sided; sheath straight above, broad at base, arcuately emarginate below, apex

¹ The present paper is the tenth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

narrow truncate, Testaceous; head (except palpi), antennæ, spot on prescutum, apical two abdominal segments, anterior tarsi, four posterior tibiæ and tarsi black. Wings brownish, venation black.

Male.—Length 6 mm. Agrees very well with the above description of the female. Hypopygidium rather narrowly rounded apically.

Type locality.—Paraiso, Canal Zone, Panama. One female (type) collected January, 1911. Trinidad River, Panama. One male (allotype) collected May, 1911. Both collected by August Busck.

Type.—Cat. No. 14586 U. S. N. M.

PTILIA LAUTIFORMIS, new species

Colored like *Ptilia lauta* Konow, but may be separated from that species by the absence of the depression in front of the anterior ocellus.

Female.—Length 8 mm. Labrum broadly rounded apically; clypeus gently arcuately emerginate, lobes broad, rounded apically; supraclypeal foveæ small, punctiform; supraclypeal area large, triangular in outline, more strongly convex dorsally; antennal furrows broad, shallow, complete to lateral ocelli; no depression in front of the anterior ocellus; postocellar line distinctly longer than the ocellular line; flagellum strongly tapering, curved; stigma broadest where the cubitus joins it, sharply tapering to apex; hind basitarsis longer than the following joints; sheath straight above, broad at base, emarginate beneath, apex narrowly pointed, Testaceous; head (except below antennæ and mouth parts), apex of flagellum, mesonotum, apical four abdominal segments, apex of hind tibiæ and hind tarsi black. Wings black, except a broad (from basal vein to apex of stigma) yellow band; venation color of wings.

Male.—Length 7 mm. Very like the female. Hypopygidium narrowly rounded apically.

Type locality.—Alhajuelo, Panama. Two females (one type) collected April, 1911, Cabima, Panama. One female collected May 24, 1911, Taboga Island, Panama. Four females and three males collected June, 1911. All collected by August Busck.

Type.—Cat. No. 14583 U. S. N. M.

ERYTHRASPIDES RUFONOTA, new species

Superficially like *sumichrasti* (Norton) but is not that species.

Female.—Length 5.5 mm. Clypeus short, anterior margin broadly produced in the middle; supraclypeal foveæ confluent with the an-

tennal foveæ; supraclypeal area rectangular in outline, gently convex ventrally, dorsally strongly convex so when seen from above it appears as a tubercle; middle foveæ elongate, long; frontal foveæ punctiform well defined, a broad furrow from them to the supraclypeal tubercle; antennal furrows and ocellar basin obsolete; postocellar area defined laterally by elongate foveæ; postocellar furrow obsolete; postocellar line distinctly longer than the ocellocular line; third antennal joint about twice as long as the fourth; stigma nearly parallel-sided, truncate apically; transverse radius received by the radius beyond the third transverse cubitus; transverse median somewhat basad to the middle of cell; sheath straight above, tapering beneath, apex nearly truncate. Black; pronotum, tegulæ, mesonotum rufous. Wings and venation blackish.

Type locality.—Corozal, Canal Zone, Panama. One female collected by August Busck April, 1911.

Type.—Cat. No. 14588 U. S. N. M.

WALDHEIMIA MELANOCEPHALA, new species

Colored like *Waldheimia ochra* (Norton), to which it is closely related, but may be separated from *ochra* by the smaller size and sharply defined middle foveæ.

Male.—Length 6 mm. Labrum short, narrowly rounded apically; clypeus truncate, lateral angles rounded, at about the middle with a transverse depressed area; supraclypeal foveæ confluent with the antennal foveæ; supraclypeal area rectangular in outline, convex, more strongly so dorsally; middle fovea oval in outline, well defined; antennal foveæ confluent with the punctiform frontal foveæ which are on a line with the middle fovea; antennal furrows obsolete; ocellar basin U-shaped open below; postocellar area defined laterally by elongate foveæ; postocellar furrow wanting; postocellar line subequal with the ocelloccipital line, but distinctly shorter than the ocellocular; stigma nearly parallel-sided, obliquely truncate apically; transverse median near the middle of cell; hypopygidium long, broadly rounded apically. Rufo-testaceous; head (except the pallid clypeus, labrum, mandibles and palpi), antennæ, tibiæ, tarsi, and cochlearium black. Wings blackish; venation blackish.

Type locality.—Cabima, Panama. Two males collected May 21, 1911, by August Busck.

Type.—Cat. No. 14587 U. S. N. M.

NESOSELANDRIA CRASSA (Cameron)

Selandria crassa CAMERON, Biol. Central. Amer. Hymen., vol. 1, 1883, p. 19.

One female, from Porto Bello, Panama, collected March, 1911, by August Busck, agrees fairly well with the unsatisfactory description of *Selandria crassa*, and also agrees with manuscript notes from the type.

PROSELANDRIA, new genus

Type.—*Prosclandria megalops* Rohwer.

Related to *Ncsoselandria* Rohwer, but separated from it by the simple tarsal claws.

Belongs to Selandriini. Clypeus truncate; malar space wanting; eyes very large, strongly converging to the clypeus; posterior orbits practically wanting; lateral ocelli well below the supraorbital line; pentagonal area wanting; pedicellum subequal in length with the scape, much longer than broad; prepectus very large, divided by a cephal-caudad suture; no accessory suture on the mesoepisternum; tarsal claws simple; hind basitarsis distinctly shorter than the following joints united; venation of the normal type; transverse median vein its length from the apex of the cell; hind anal cell sessile at the apex.

To this genus also belongs: *Selandria glabra* Kirby, *Selandria curialis* Cresson, *Selandria luteola* Cameron, *Selandria leucopoda* Cameron, *Selandria mutica* Cameron and *Tenthredo delicatula* Kirby.

PROSELANDRIA MEGALOPS, new species

Male.—Length 4.5 mm. Supraclypeal foveæ not sharply defined, confluent with the antennal foveæ; supraclypeal area convex; middle fovea transverse, much below the level of the punctiform frontal foveæ; antennal furrows obsolete; foveæ bounding the postocellar area elongate; postocellar furrow obsolete; postocellar line subequal with the ocelloccipital line, about half as long as the ocellocular line; stigma about twice as long as wide, slightly broader near base, truncate apically; second and third cubital cells subequal in length; transverse radius received near the middle of the third cubital; hypopygidium broadly rounded apically. Rufo-ferruginous; head, antennæ, spot on the prescutum, apical three abdominal segments, legs below the femora black; wings dark brown, venation the same color.

Type locality.—Porto Bello, Panama. One male collected March, 1911, by August Busck.

Type.—Cat. No. 14616 U. S. N. M.

STROMBOCEROS (STROMBOCERIDEA) MACULIPENNIS (Cameron)

Strongylogaster maculipennis CAMERON, Biol. Central. Amer. Hym., vol. 1, 1833 May, p. 9.

Two females from Cabima, Panama. Collected in May by August Busck.

ACORDULOCERIDEA, new genus

Type.—*Acorduloceridea compressicornis* Rohwer.

Belongs to Acordulocerini and may easily be separated from *Acordulocera* Say by the number of antennal joints; sharply defined, elongate prescutum; and longer mesonotum. In Konow's tribe Lobocerotides it would seem to run nearest to *Lycosceles* Konow but will not agree with the description of that genus, being readily distinguished by the presence of a superapical spur.

Clypeus truncate; malar space wanting; eyes very large, slightly converging to the clypeus; posterior orbits nearly wanting, lateral ocelli well below the supraorbital line; antennæ hairy, inserted well above the clypeus, seven-jointed, scape elongate, pedicellum much wider than long, flagellum long, tapering; prescutum sharply defined, remote from the anterior margin of the scutellum, more than twice as long as the anterior width, with a median sulcus, mesoscutum and prescutum combined about twice as long as broad; thorax otherwise similar to *Acordulocera*; legs rather long; calcaria long; four posterior tibiæ with (one each) superapical spurs; tarsal claws simple; hind basitarsis slightly shorter than the following joints; fore radial cell not appendiculate; anal vein simple; transverse median vein near basal third; all the transverse cubits nearly completely bulleted, the first nearly interstitial with the first recurrent; first two cubital cells large, subequal in length, the second receiving both recurrent veins; third cubital cell very small; radial cell of hind wings closed and appendiculated on the lower margin; otherwise the venation is very like *Acordulocera*.

ACORDULOCERIDEA COMPRESSICORNIS, new species

Male.—Length 3.5 mm. Supraclypeal foveæ very broad, shallow, not confluent with the antennal foveæ; supraclypeal area gently convex; antennal foveæ large; frontal carina prominent; frontal crest angled below; middle fovea, ocellar basin, postocellar furrow, obsolete; antennal furrows only indicated by shallow depressions; postocellar line longer than the ocellocular; postocellar area not defined; antennæ nearly as long as the rest of the insect, compressed,

third joint longer than the fourth, subequal in length with the apical joint, intermediate joints subequal; prescutum with a few scattered setigous punctures; stigma broadest at base gently tapering to the apex; hypopygidium nearly truncate. Ferruginous; flagellum, prescutum, scutum (posterior middle piceous), metanotum, tergum, four hind tarsi, and apices of hind tibiæ black; scutellum rufo-piceous; wings dusky hyaline; venation dark brown.

Type locality.—Taboga Island, Panama. One male collected June, 1911, by August Busck.

Type.—Cat. No. 14620 U. S. N. M.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

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NEW DECAPOD CRUSTACEANS FROM
PANAMA

BY

MARY J. RATHBUN



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NEW DECAPOD CRUSTACEANS FROM PANAMA¹

By MARY J. RATHBUN

The new species and subspecies here described form part of a large collection made in Panama, in 1911, by Dr. S. E. Meek and Mr. S. F. Hildebrand. A complete report on the material with illustrations of the new forms will be published later.

MACROBRACHIUM ACANTHURUS PANAMENSE, new subspecies

Differs from typical *M. acanthurus*² in its constantly longer and more ascending rostrum, with more numerous spines $\frac{8-10}{6-9}$. There is an unarmed space behind the subterminal spines, which may, however, be interrupted by a single spine. The antennal peduncle just reaches the end of the first segment of the antennular peduncle. The merus of the legs of the second pair reach only to about the distal third of the scales; legs nearly smooth to the touch; *palms enlarged*, so that their circumference is greater than that of the distal end of the carpus, and definitely *shorter than the fingers*; fingers slender, almost naked, taken together narrower than the palm. *Telson continued posteriorly in an elongated triangular tooth*, the base of which is nearly as wide as the telson, and the sides nearly straight; this tooth is twice as long as the inner of the side spines, except in the young.

Dimensions.—Male from Rio Calabre: length of body, 11.2 cm.; length of foot of second pair, 71 mm.; of merus, 13 mm.; of carpus, 17 mm.; of palm, 12 mm.; of dactylus, 14 mm.

Type locality.—Rio Calabre, Republic of Panama; March 18, 1911.

Type specimen.—Male, Cat. No. 43656, U. S. Nat. Mus.

Specimens from three different localities show varying combinations of the characters which differentiate typical *acanthurus* from *acanthurus panamense*.

PSEUDOTHELPHUSA MASIMBARI, new species

Carapace depressed; gastric and branchial regions very slightly and separately convex; cervical suture curved; surface covered with a pavement of fine flattened granules which can be seen in large part

¹ This paper is the eleventh dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

² *Palæmon acanthurus* Wiegmann, Arch. f. Nat., Jahrg. 2, Bd. 1, 1836, p. 150.

with the naked eye; on the frontal and lateral regions many of the granules are coarser and more elevated; punctæ fine but visible without a lens. A deep median furrow runs between the epigastric lobes and is continued to the front forming a V-shaped notch in the upper margin. This margin viewed from above is convex, bending backward at the sides so that it meets the orbital margin on the dorsal plane; its edge bears a row of tubercles and projects over the concave surface of the front, but does not conceal the lateral margins of the front or the lobes of the inferior margin; this last is sinuous while the side margins are oblique; front deepest toward the outer ends. The lateral margins of the carapace are distinctly serrate, the teeth smaller in front of the cervical suture; in addition there is an ill-marked hepatic tooth, and on the right side only an indication of a cervical tooth. The orbits in front view are large compared to the eyes and are subrhomboidal with the sides of the rhomb subparallel; upper margin with shallow crenulations, lower margin with deeper ones and a rounded notch below the outer angle.

Maxillipeds rather broad, the outer margin of the merus rounding gradually into the anterior margin; ischium much wider anteriorly than posteriorly. Exognath reaching about half length of ischium. Chelipeds very unequal, stout. Merus with outer margin serrate and rugose, lower margin tuberculate, inner upper margin armed with coarse spines, below a few of which there is a tubercle; carpus rough with granulated rugæ; inner spine very sharp; chelæ covered with coarse punctæ; the right or larger palm measures very little longer above than its greatest width, while it is thicker than half its width; fingers armed with stout teeth which meet, while the tips of the fingers cross. Merus joints of ambulatory legs dilated, upper margins serrulate.

Dimensions.—Female, total length of carapace, 33.2 mm.; width, 51 mm.; width between outer angles of orbits, 31 mm.; superior width of front, 16.7 mm.; inferior width of front, 13.5 mm.

Type locality.—Rio Masimbar, Empire, Canal Zone; Feb. 8, 1911; one adult female.

Type specimen.—Cat. No. 43657, U. S. Nat. Mus.

Closely allied to *P. tuberculata*¹ Rathbun, but narrower, front deeper, orbit more rhomboidal, palm of larger cheliped without the large tubercle at base of fingers which is present in *tuberculata*.

¹ Bull. Mus. Hist. Nat., Paris, 1897, p. 60.

LEPTODIUS TABOGANUS, new species

Carapace about $\frac{3}{5}$ as long as wide, suboval; anterior $\frac{2}{3}$ deeply areolated and crossed by granulated rugæ; a well-marked straight, transverse ridge runs across the branchial region in line with the posterior border of the gastric region and just behind the transverse ridge which runs inward from the tip of the last tooth of the lateral margin. Front nearly transverse, composed of two lobes separated by a V-shaped notch, each lobe very slightly concave and more advanced at the inner than the outer angle. Of the five lateral teeth (which include the angle of the orbit), the second and third are blunt, the fourth subacute, the fifth acute; the third tooth is very obtuse-angled, the fourth a little more than a right angle, the fifth is acute-angled and points directly outward. Lower margin of orbit very prominent, its entire margin showing in dorsal view when the eye is retracted.

Outer surface of carpus and upper half of exposed surface of palm of the unequal chelipeds coarsely granulate, the surface roughened by irregular depressions and ridges. The black color of the immovable finger extends well up on the palm. Lower margin of larger palm very convex; about three teeth on each finger; the most distal tooth of the thumb of the larger chela is noticeably larger than the other teeth; tips of fingers distinctly spooned. Legs fringed with coarse hair.

Dimensions.—Male, length of carapace, 12.6 mm.; width, 20 mm.; fronto-orbital width, 12 mm.

Type locality.—Taboga Island, Bay of Panama; May 11-15, 1911; 3 males, 1 female.

Type specimen.—Male, Cat. No. 43658, U. S. Nat. Mus.

Allied to *L. occidentalis* Stimpson,¹ but carapace wider, fronto-orbital width greater, lateral teeth extending further back and of different shape, the dark color of the fingers runs further back on the palm and the abdomen of the male is narrower, especially so in the last two segments.

¹ Ann. Lyc. Nat. Hist. New York, Vol. 10, 1871, p. 108.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 59, NUMBER 14

REPORT ON LANDSHELLS COLLECTED IN PERU IN 1911
BY THE YALE EXPEDITION UNDER PROFESSOR HIRAM
BINGHAM, WITH DESCRIPTIONS OF A NEW SUBGENUS,
A NEW SPECIES, AND NEW VARIETIES

BY

WILLIAM HEALEY DALL



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REPORT ON LANDSHELLS COLLECTED IN PERU IN 1911
BY THE YALE EXPEDITION UNDER PROFESSOR
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SUBGENUS, A NEW SPECIES, AND NEW VARIETIES

By WILLIAM HEALEY DALL

This expedition under the auspices of the Yale Corporation reached Peru in June, 1911, and proceeded to Cuzco. The collections were made chiefly in the Urubamba Valley, a region which had been visited by Angrand, and perhaps other collectors, but, of which, as regards its molluscan fauna comparatively little was known.

The region seems to possess a fauna of which the species are very wide-spread, and mostly have been described from other localities. A few new varieties and one new species were among the shells collected, and the addition to our knowledge of the distribution of the species is valuable.

But the most interesting result is the discovery of a new and remarkable group among the Bulimulidæ, characterized by a peculiar internal protective armature behind which the animal can retreat when menaced by such enemies as the predaceous millipedes, which are known to feed upon living pulmonate mollusks.

This internal armature has not been previously noted, as the shells are uncommon in collections and this feature can only be observed by opening the whorls of the spire.

Professor H. W. Foote, in charge of the natural history work of the party collected most of the shells here enumerated.

Professor Foote writes in regard to the situs of the shells as follows:

It was the dry season and winter when I was in Peru and it seemed to be a resting period for all the snails we saw. They were not moving and appeared to be glued to their resting places in all cases.

The specimens labelled "near Maras" were all found on bushes, and I think thousands of them could have been obtained in a day. The region where they were was somewhat dry, or at least there is a long dry season, and it was above the tree line.

The shells labelled "Santa Ana" were from the valley of the Urubamba River and were rather hard to find. Most of them were fastened on the under side of shelving rocks. We collected nearly all we saw, but, judging by the number of dead shells, snails must be common there in the wet season. The

region was originally heavily forested, but has been cleared and a second growth of brush has taken the place of the original forest which does not grow again.

It may be added that though some of the *Drymæus* were collected in August, 1911, and were not received by the present writer until March, 1912, a certain number of them were still living at the latter date. All the specimens of *Phenacotaxus* and *Peronæus* had become entirely desiccated.

LIST OF THE SPECIES OBTAINED.

BORUS MATHIUSII Orbigny

Helix mathiusii ORB., Guérin Mag. de Zoöl. 1835, p. 16.

Strophocheilus (Borus) mathiusii PILSBRY, Man. Conch., vol. 10, p. 17, pl. 7, f. 4, 5; pl. 9, f. 45, 1895.

Near Santa Ana, Eastern Peru, at a height of 3500 feet.

The species is finely spirally striated and has a white peristome. U. S. N. Mus., No. 250238.

BORUS CAPILLACEUS Pfeiffer

Bulimus capillaceus PFR., P. Z. S. 1855, p. 93; Hupé, in Castelnau Exp. p. 26, pl. 4, f. 3, 1857.

Strophocheilus (Borus) capillaceus PILSBRY, Man. Conch., vol. 10, p. 31, pl. 14, f. 69, 1895.

Found with the preceding. The shell is of a more whitish color, has no spiral sculpture, and the peristome when fresh is of a deep rose-pink. U. S. N. Mus., No. 250241.

SCUTALUS REVINCTUS Hupé

Bulimus revinctus HUPÉ, in Castelnau Exp. p. 39, pl. 7, f. 2, 1857.

Bulimulus (Scutalus) revinctus PILSBRY, Man. Conch., vol. 11, p. 17, pl. 3, f. 34-40, 1895.

Between Ollantaytambo and Maras, in Eastern Peru, at an elevation of 10,000 to 11,000 feet. Several not quite mature specimens were obtained. U. S. N. Mus., No. 250242.

DRYMÆUS TORALLYI Orbigny

Helix torallyi ORB., Guérin, Mag. de Zoöl. 1835, p. 11.

Drymæus torallyi PILSBRY, Man. Conch., vol. 11, p. 278, pl. 44, f. 97, 98, 99, 1, 2, 3; 1895.

Near Camana, west coast of Peru, at 2000 feet elevation. The specimens have a wider umbilicus than the typical form. U. S. N. Mus., No. 250243.

DRYMÆUS LONGINQUUS Morelet

Bulimus longinquus MORELET, Ser. Conchyl., vol. 3, p. 195, pl. 11, f. 2; April 1863.

Drymæus longinquus PILSBRY, Man. Conch., vol. 11, p. 293, pl. 50, f. 93, 94, 1898.

?*Bulimus amœnus* BONNET, Rev. and Mag. de Zoöl. 1864, p. 70, pl. 6, f. 2; not of Pfeiffer, 1847.

Between Ollantaytambo and Maras, Eastern Peru, at a height of 10,000 to 11,000 feet. U. S. N. Mus. 250244. This species and that of Bonnet are so similar that it seems possible that they are identical, and that Bonnet's locality questioned by Pilsbry is right after all. The *D. corumbaënsis* Pilsbry, from Eastern Brazil is probably distinct.

DRYMÆUS PÆCILUS Orbigny

Helix (Cochlogena) pæcila ORB., Guérin, Mag. de Zoöl., 1835, p. 11.

Bulimus pæcilus ORB., Voy. Am. MÉR., p. 268, pl. 31, f. 1-10, 1837.

Bulimus pictus BONNET, Mag. de Zoöl. (2) vol. 16, 1864, p. 69, pl. 5, f. 4-6; pl. 6, f. 1.

Bulimus (Mesembrinus) pæcilus LUBOMIRSKI, Proc. Zoöl. Soc. Lond. for 1879, p. 725 (Chota, Peru).

Eastern Peru, from 3500 to 11,000 feet elevation.

This form is one of the most puzzling and apparently variable that I know of, but the large series collected by the Yale Expedition permits one to come to some conclusions. The possession of specimens of Orbigny's species obtained from him by Dr. Isaac Lea has been of material assistance. I feel some doubt as to the identity of the specimens referred to by Doctor Pilsbry as coming from Matto Grosso, Brazil, with the Yale Peruvian form, and it is possible we have to do with several distinct species which pass through an analogous series of color variations.

Orbigny's variety *major* has a nearly black apex, which is not found in his variety *minor* (so far as our specimens indicate) nor in any of the specimens collected by the Yale Expedition. The specimens noted by Lubomirsky from Chota, Peru, also did not possess this feature.

Orbigny's specimens of both varieties have an imperforate umbilicus; variety *major* has a wide reflection of the pillar lip, with a space behind it, but no perforation, his variety *minor* lacks even this, there being only a very minute chink and narrow reflection. Beside Orbigny's specimens we have others from Venezuela taken in the Sierra Madre Mountains at an altitude of 6000 feet, and some from Corumbá, Brazil, all of the variety *minor*.

Except the pure white form (which may be a distinct species) all the Yale specimens have well developed, or traceable, the following characters: (1) A perforate axis with usually (when fully adult) a wide funicular space behind the reflected lip at the entrance of the perforation; (2) a more or less interrupted brown spiral band in front of the suture; (3) a very marked dark, often black spiral band, which is covered by the advancing lip, immediately under the suture. When nearly all the other brown markings are obsolete this single band is very persistent, and is absent only when all the other spiral dark bands, except the umbilical band, are absent; (4) a broad dark band in the atrium of the umbilicus, the most persistent of all; (5) between the subsutural and preceding antesutural bands on the last whorl are several minor, narrower and less persistent bands, usually more or less broken up into dots or patches. The normal number of these seems to be three, but one is sometimes absent or fused with one of the others. Between the subsutural and umbilical bands there are one usually and sometimes two minor bands of which one is always less strong than the other. All these bands may be absent or feeble, but the umbilical band is usually traceable. The axial brown coloring is present in vertical streaks, when the shell is melanitic the color seems to flow at the intersection of the spiral bands with these streaks leading to an appearance which might be described as "strung triangles." These, in very dark specimens, become more or less nebulous or indistinctly limited. The spirals by themselves may fuse till nearly the whole shell is dark colored. In Orbigny's varieties there is no umbilical dark band and the shell is markedly white under the pattern, while the Yale Expedition specimens tend to creamy or pale buff rather than white. As a majority of the Yale specimens came from the vicinity of Santa Ana, I propose to call this type variety *santanensis* and restrict to Orbigny's form the designation *pæcilus* s. s.

The former has, as has been indicated, a great variety of color mutants, the more conspicuous of which may be enumerated as follows:

- I. (variety?) *percandidus* Dall, nov. Shell pure white, seven-whorled, perforate, surface somewhat rudely, axially striated, with, on the last whorl, rather distant, somewhat irregular, widely separated, minute axial ridges. Length of shell 32; of aperture, 17; max. diameter of shell, 17 mm.

Above Santa Ana, opposite Chinche, at 3500 feet elevation, and above Ollantaytambo at 10,000 feet elevation. U. S. N. Mus., No. 250245.

2. Mutation *A*. Shell creamy white with faint, axial, gray or pale brownish streaks, and traces of obsolete spirals as grayish bands.

Ollantaytambo, at 10,000 feet elevation. U. S. N. Mus., No. 250247.

3. Mutation *B*. Pale buff with darker axial streaks, apex rosy; no spirals except the conspicuous umbilical band.

Three leagues above Santa Ana, opposite Chinche, 3500 feet elevation. U. S. N. Mus., No. 250248.

4. Mutation *C*. Buff with broken spirals except subsutural and umbilical bands; apex corneous.

Same locality as *B*. U. S. N. Mus., No. 250249.

5. Mutation *D*. Buff with sharply defined subsutural and umbilical spirals, the other spirals absent or barely traceable.

Same locality as *B*. U. S. N. Mus., No. 250250.

6. Mutation *E*. Larger, darker, subsutural band wide and strong, the others mostly broken, the axial streaks dark brown.

Same locality as *B*. U. S. N. Mus., No. 250251.

7. Mutation *F*. Axial streaks dark and strong. All spirals absent or obsolete.

Above Ollantaytambo, 10,000 feet elevation. U. S. N. Mus., No. 250252.

8. Mutation *G*. Spirals chocolate brown, more or less fused; axials strong; with an effect of a peripheral whitish band.

Between Ollantaytambo and Maras, 10,000 to 11,000 feet elevation. U. S. N. Mus., No. 250254.

9. Mutation *H*. Larger, antesutural band much broken, subsutural strong, others mostly broken, but strong.

Same location as *B*. U. S. N. Mus., No. 250253.

10. Mutation *I*. Smaller, spirals dark and close set with "strung triangles" effect over axial streaks.

Same location as *B*. U. S. N. Mus., No. 250255.

11. Mutation *J*. Very dark, all spirals strong and close set, more or less nebulous, apex rosy.

Same location as *B*. U. S. N. Mus., No. 250257.

The *D. humboldti* of Reeve, while belonging to the same general group, seems to be a very distinct form, represented in the U. S. N. Mus. by specimens from Urubamba, Peru (No. 110065).

DRYMÆUS BEYERLEANUS Hupé

Bulimus beyerleanus HUPÉ, in Castelnau, Anim. Nouv. Am. du Sud. p. 50, pl. 6, f. 6, 1857.

Drymæus beyerleanus PILSBRY, Man. Conch., vol. 11, p. 197, pl. 38, f. 4, 5, May, 1898.

Under rocks at Lucma, Peru, 7000 feet elevation, also three leagues above Santa Ana, Eastern Peru, Yale Expedition, 3500 feet elevation.

While this may be, as claimed by some naturalists, a mutation of *B. zoögraphicus* Orb., it is the exact type which Hupé named *beyerleanus*. U. S. N. Mus., No. 250258.

D. BEYERLEANUS var. **MITCHELLI** Dall, nov.¹

With the preceding, but, so far as the collections show, without intergradations.

Shell somewhat more slender than *beyerleanus*, with the same number of whorls; the peristome less reflected, the pillar more slender and slightly gyrate. Color of pinkish buff, disposed in alternating darker and paler axial streaks. Interior of the aperture pale lilac. Height, 41.0; aperture, 20.0; maximum diameter, 15.0 mm. U. S. N. Mus., No. 250260.

BULIMULUS TYLERI Dall, n. n.²

Bulimus simplex HUPÉ, Castelnau, Nouv. Anim. Am. du Sud. p. 53, pl. 9, f. 6, 1857, not of Jonas, P. Z. S. 1842, p. 189.

Above Santa Ana, opposite Chinche, Peru, at 3500 feet elevation. U. S. N. Mus., No. 250261.

Two specimens agreeing with Hupé's figure and description were collected as above, thus confirming the habitat given by him, which had been questioned.

Subgenus ATAXUS Albers

Ataxus ALBERS, Die Heliceen, p. 164, 1850. Type *Bulimus umbilicaris* Souleyet.

Owing to the kindness of Dr. H. A. Pilsbry of the Academy of Natural Sciences, Philadelphia, I have been able to examine a specimen of the type of the subgenus, which is notable for its deep tubular umbilicus extending to the apical part of the shell and bordered by a blunt carina on the base of the shell. On opening the specimen so as to expose the interior of the whorls, the axis is seen to be very

¹ Named in honor of Alfreda Mitchell at the request of Dr. Bingham.

² Named in honor of Mr. Victor Tyler at the request of Dr. Bingham.

simple, without irregularities or laminæ on any part of the interior surface. U. S. N. Mus., No. 214369.

There are a number of species which have been referred to this group which do not agree with *Ataxus* except in external characters. They have developed an elaborate system of lamination within the whorl, but so far back from the aperture that only by opening the shell can it be observed, somewhat as in *Holospira*.

The species I have been able to examine are *scalaricosta* Morelet, *infundibulum* Pfeiffer, *umbilicatellus* Pilsbry, *tubulatus* Morelet, and *spiculatus* Morelet, which last from its want of the wide umbilicus had been referred to *Peronæus*.

It is evident that a new name is required for the forms with an internal armature, for which I propose the name *Phenacotaxus* and divide this into two sections, *Phenacotaxus* s. s. and *Ataxellus*; as follows:

Subgenus PHENACOTAXUS Dall, nov.

Type *Bulimulus (Ataxus) umbilicatellus* Pilsbry.

Shell elongate or fusiform, slender, axially sculptured, the pillar with a plication beginning in the posterior half of the last whorl and extending nearly to the apex, the plica at intervals widely expanding laterally into the lumen of the whorl.

Section *Phenacotaxus* s. s.

Shell with a funicular wide umbilicus extending to the apex, narrowing the whorl and aperture, and making the axis tubular.

Section *Ataxellus* Dall, nov.

Shell very elongate, imperforate, the axis thread-like, gyrate. Type (*Bulimus spiculatus* Morelet, var.?) *A. pectinatus* Dall, n. sp.?

PHENACOTAXUS SCALARICOSTA Morelet

Bulimus scalaricosta Mor., Journ. de Conchyl., vol. 8, 1860, p. 375; Sér. Conchyl. vol. 3, p. 205, pl. 11, f. 8, Apr. 1863. (Plateau of Andamarca, province of Cuzco, Peru.)

Between Ollantaytambo and Maras, Peru, at 10,000 to 11,000 feet elevation. U. S. N. Mus., No. 250262.

This species has a narrow holostomate aperture almost separated from the preceding whorl.

The axial plica is invisible from the aperture and begins in the first half of the last whorl near the base, where it forms a broad, strong lamella curving distally toward the base of the whorl, and about half

as wide as the lumen of the whorl. As it recedes toward the apex of the spire it becomes narrower and also ascends more rapidly than the coil of the whorl, so that when it has completed one turn it appears midway between the roof and base of the whorl and is also much reduced in width; at the completion of the second turn it is close to the roof of the whorl and exhibits a short, broad subtriangular horizontal expansion; in the next turn it has become again a simple thread-like, low plica which is at the junction of the roof of the whorl and the axial wall, and so continues up the spire.

PHENACOTAXUS INFUNDIBULUM Pfeiffer

Bulimus infundibulum PFR., Proc. Zoöl. Soc. Lond. for 1851, p. 255.

Bulimulus (Ataxus) infundibulum PILSBRY, Man. Conch. 10, p. 131, pl. 44, f. 89-92, Mar. 1896.

Right bank of the Rio Pampas, on road from Bombon to Pajonal, Peru. Dr. H. Bingham.¹ U. S. N. Mus., No. 209266. Province of Ayachuco, Peru, Pfeiffer.

In this species the internal lamella begins abruptly in the inner half of the last whorl as a strong, stout plate with a much thickened distal edge which nearly reaches the opposite (outer) wall of the whorl, and has its margin recurved toward the base of the whorl. The part joining the pillar wall is thin, and (in the specimen examined) has a rather large perforation. The plate curves round the inner wall of the whorl, ascending in one turn from the middle of that wall nearly to the angle of that wall with the roof of the next whorl, and at the same time diminishes in size and strength to a low, sharp, simple lamella. This is traceable as a mere thread in the two preceding whorls.

PHENACOTAXUS UMBILICATELLUS Pilsbry

Bulimulus (Bostryx, Ataxus) infundibulum var. *umbilicattellus* PILSBRY, Man. Conch., vol. 10, p. 131, pl. 44, f. 93, 94, March 1896.

Bulimulus (Bostryx) umbilicattellus DALL, Proc. U. S. N. Mus., vol. 38, No. 1736, p. 179, June 1910.

Rio Pampas, with the last species, Dr. Bingham. U. S. N. Mus., No. 161618.

Externally this species differs chiefly from *A. infundibulum* by being more slender, so that Dr. Pilsbry regarded it as only a variety of the latter; and this opinion was justified by the appearance of the

¹ These specimens were obtained by Dr. Bingham on a previous journey, the mollusks of which are described in the Proceedings of the U. S. Nat. Museum, number 1736, pp. 177-182, June, 1910.

shells. By breaking or grinding away the outer wall of the later whorls and revealing the hidden lamination, it is seen to be quite different in the two forms. As often happens in *Holospira* a similar exterior masks two very unlike interior arrangements.

In the present species instead of beginning abruptly and reaching its greatest extension in the first half of the last whorl as in *infundibulum*, the lamina begins gradually near the base of the pillar wall and rises for a third of a whorl before beginning its strongest development, when it forms a remarkably stout horizontal lamina with a broad, flat edge almost touching the outer wall, and, rising ob-



FIG. 1



FIG. 2

FIG. 1.—*Ataxus umbilicatellus*, part of front wall removed showing hidden lamina. 3/1.

FIG. 2.—*Ataxus umbilicatellus*, part of shell removed showing opposite view of lamina. 3/1.

liquely in the lumen of the penultimate whorl, continues in the angle between the axial wall and the roof of the whorl. Then it suddenly becomes thin, and immediately low, and continues in the antepenultimate whorl as little more than a sharp raised thread.

The peculiarities of this spiral lamina as observed in the several species, include its beginning so far back from the aperture, its near occlusion of the passage when at its strongest, the enlargement or recurvation of the distal edge, the curious oblique course not parallel with the gyre of the whorls, and, in the more elongated forms, of the duplication or repetition of the expansion at different points in the spire. Its function is probably protective, as it almost closes the aperture, and the animal can retreat behind the most obstructive portion.

PHENACOTAXUS TUBULATUS Morelet

Bulimus tubulatus MORELET, Journ. de Conchyl., vol. 8, 1860, p. 375; Sér. Conch., vol. 3, p. 204, pl. 11, f. 4, 1863.

Bulimulus (Bostryx, Ataxus) tubulatus PILSBRY, Man. Conch., vol. 10, p. 132, pl. 44, f. 95, 96. Mar. 1896.

Valley of Andahuaylas, Peru (Angrand); Urubamba Valley, at 9000 feet elevation (Rolle).

In this species the lamella begins gradually and reaches laterally only about half way across the whorl. It is more slender and less thickened at the distal margin than in *P. infundibulum* and the undulations in the width as it ascends are less marked, though quite evident. It does not ascend the axis as rapidly as in the preceding species. Beginning below the middle of the axial wall, in the next preceding whorl it is very slightly above the middle and becomes obsolete in the next preceding whorl. There is, however, some difference between the development of the lamina in different specimens. U. S. N. Mus., No. 110072.

PHENACOTAXUS (ATAXELLUS) SPICULATUS Mor. var. **PECTINATUS** Dall, nov.

Bulimus spiculatus MORELET, Journ. de Conchyl. 1860, p. 375; Sér. Conchyl., vol. 3, p. 203, pl. 11, f. 3, 1863.

Bulimulus (Bostryx, Peronæus) spiculatus PILSBRY, Man. Conch., vol. 10, p. 144, pl. 45, f. 29, 1896.

Above Ollantaytambo, Peru, at 10,000 feet elevation, Yale Expedition. Valley of Ollantaytambo, Angrand, in Morelet. U. S. N. Mus., No. 250263.

The shell externally agrees in form and character of sculpture in the main with Morelet's figure. Dr. Bingham's specimens differ by being perfectly white instead of brown streaked, and, while *B. spiculatus* is stated to be without spiral sculpture, the present variety is sharply, spirally striated, though the striæ are not equally visible over the whole shell. The dimensions are: Height, 21.5; length of aperture, 5.0; max. diameter, 4.0 mm. The axis of the shell is entirely imperforate; within the first half of the last whorl it becomes very slender, thread-like, and slightly gyrate. The lamina begins as a short, subtriangular, flexuous, and recurved plate; ascending the axis as a low lamina, has a small triangular expansion in the second preceding whorl, and becomes obsolescent in the whorl above. It also approaches nearer to the roof of the whorl as it ascends.

The next species, though having a close general resemblance to *spiculatus* except in its smoother surface, has the axis quite simple and normal, with no laminose developments whatever.

BOSTRYX (PERONÆUS) ACROMELAS Morelet

Bulimus acromelas MORELET, Sér. Conchyl., vol. 3, p. 202, pl. 11, f. 1, 1863.
Bulimulus (Bostryx, Peronæus) acromelas PILSBRY, Man. Conch., vol. 10,
p. 144, pl. 45, f. 31, 1896.

Valleys of Ayacucho and Urubamba, Peru (Angrand). Between Ollantaytambo and Maras, at an elevation of 10,000 to 11,000 feet, Yale Expedition. U. S. N. Mus., No. 250264.

Very similar to the last, but smoother, with no spiral striation, and with a conspicuous purple-black apex of three or four whorls.

EPIPHRAGMOPHORA CLAROMPHALOS Deville & Hupé

Lysinoë claromphalos D. and H., Guérin's Mag. de Zoöl. 1850, pl. 14, f. 1.
Epiphragmophora claromphalos PILSBRY, Man. Conch., vol. 9, 1894, p. 198;
vol. 4, p. 80, pl. 18, f. 55, 56.

Near Santa Ana, at 3500 feet; and above Ollantaytambo, Eastern Peru, at 10,000 feet, Yale Expedition. U. S. N. Mus., No. 250265.

This species closely resembles in its general features the larger Californian species of the group of *E. mormonum*.

DREPANOSTOMELLA AMMONIFORMIS Orbigny

Helix ammoniformis ORB., Guérin, Mag. de Zoöl. 1835, p. 5; Voy. Am. Mér.
p. 248, pl. 26, f. 10-13, 1837.
Streptaxis ammoniformis TRYON, Man. Conch., vol. 1, p. 65, pl. 13, f. 43-45,
1885.
Drepanostomella ammoniformis BGT., Moll. de l'Afrique Equatoriale, p.
42, 1889.

Above Ollantaytambo, Eastern Peru, at 10,000 feet elevation. Province of Yungas, Bolivia, Orbigny. U. S. N. Mus., No. 250269.

A single not quite mature specimen was taken by the Yale Expedition.

HAPPIA FOOTEI Dall, sp. nov.

Above Santa Ana, opposite Chinche, at about 3500 feet elevation, Yale Expedition.

Shell of a light yellowish or corneous color, depressed, brilliantly polished, with five and a half whorls; spire almost flat, with a strongly marked suture; outer whorl slightly obliquely flattened above; sculpture of faint incremental lines; aperture hardly descending, oblique, the peristome sharp, simple, not continuous over the body; base more rounded than the summit, with a broad, scalar umbilicus, revealing all the whorls; height, 4.0; max. diameter, 12.0; min. diameter, 9.6 mm. Type U. S. N. Mus., No. 250268.

This belongs in the same group with Preston's *Polita peruviana*, but is considerably larger, with a relatively much larger umbilicus, and has a slight flattening of the body whorl which makes the section of the whorl less rounded above than in Preston's species, of which the National Museum possesses the type specimen. The species is named in honor of Professor H. W. Foote of the expedition.

A small slug was obtained at Cuzco in some numbers, but arrived in such poor preservation that it could afford little or no information on dissection.

SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 59, NUMBER 15

THE NAMES OF THE LARGE WOLVES
OF NORTHERN AND WESTERN
NORTH AMERICA

BY
GERRIT S. MILLER, JR.



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THE NAMES OF THE LARGE WOLVES OF NORTHERN AND WESTERN NORTH AMERICA

By GERRIT S. MILLER, JR.

Examination of the skulls of the American wolves of the subgenus *Canis* in the U. S. National Museum, shows that the general region lying west of the Mississippi River and Hudson Bay, and north of the Platte and Columbia rivers, is inhabited by animals of three well defined types: (a) The timber-wolf type, distinguished by extremely large size (condylobasal length of skull in largest males about 265 mm.); (b) the plains-wolf type, moderate in size (condylobasal length of skull in largest males about 240 mm.), rostrum broad, palate wide in proportion to its length; and (c) the tundra-wolf type of the Arctic coast region, size as in the plains-wolf, but rostrum slender and palate narrow in proportion to its length. While the material at hand is not sufficient to form the basis of a detailed monograph of the northern and western wolves, it has enabled me to trace the history of the ten names which have been applied to the animals. So far as I am aware, no previous attempt has been made to allocate these names.

Albus.—*Canis lupus—albus* Sabine, Franklin's Narr. Journ. Polar Sea, p. 655, 1823. Type locality, Fort Enterprise, MacKenzie, Canada. This name has been used for the Barren Ground wolf by Preble (North Amer. Fauna, No. 27, p. 213, October 26, 1908), though the great size of the animal mentioned by Sabine makes it appear probable that the type specimen was an albinistic timber-wolf. The name is preoccupied by *Canis lupus albus* Kerr, 1791 (Anim. Kingd., p. 137), applied to a Siberian wolf.¹

¹ As the Barren Ground wolf has received no other name, it may be known as *Canis tundrarum*. Type: adult male (probably), skull No. 16748, U. S. National Museum. Collected at Point Barrow, Alaska, by Lt. P. H. Ray. Size much less than in the northern timber-wolf, the skull and teeth about as in the plains-wolf of the northern United States, but rostrum and palate narrower. Color said to be frequently white or whitish. Condylobasal length of skull, 241.5; zygomatic breadth, 37. Specimens examined (all skulls): Point Barrow, 2; northwest of Fort Yukon (about 100 miles), Alaska, 1; Peel River, Yukon, 1. Three skulls from Fort Chimo, Ungava, appear to represent the same animal. This wolf is decidedly larger than *Canis lycaon*

Ater.—[*Canis lupus, occidentalis*] var. E. *Lupus ater* Richardson, Fauna Boreali Americana, Vol. 1, p. 70, 1829. Applied to the melanistic individuals supposed by Richardson to occur throughout the range of the American *Canis lupus*. The name *ater* is therefore a synonym of *occidentalis*.¹

Gigas.—*Lupus gigas* Townsend, Journ. Acad. Nat. Sci. Philadelphia, N. S., Vol. 2, p. 75. Type locality, "one and a half or two miles west of Fort Vancouver," Washington. This is the first name applied to the timber-wolf of the northwest coast. A skull from Puget Sound (No. 3438) indicates an animal differing from the timber-wolf of the interior region in less great size and in less enlarged teeth.

Griseo-albus.—*Canis occidentalis* var. *griseo-albus* Baird, Mamm. North Amer., p. 104, 1857. This name was used by Baird to indicate the normal color variety of the American wolf, the diagnosis of which is: "Color, pure white to grizzled gray." It is thus exactly equivalent to his *occidentalis*.

Griseus.—*Canis lupus—griseus* Sabine, Franklin's Narr. Journ. Polar Sea., p. 654, 1823. Type locality, Cumberland House, Keewatin, Canada. This is the first name based on the northern timber-wolf. As pointed out by Bangs (Amer. Nat., Vol. 32, p. 505, July, 1898), it is preoccupied by *Canis griseus* Boddaert 1784, a synonym of *Urocyon cinereoargenteus*.

Nubilus.—*Canis nubilus* Say, Long's Exped. Rocky Mts., Vol. 1, p. 169, 1825. Type locality, Engineer Cantonment, near present town of Blair, Washington County, Nebraska. The first name applied to the plains-wolf of the central United States and adjoining portions of Canada.

Occidentalis.—*Canis lupus, occidentalis* Richardson, Fauna Boreali Americana, Vol. 1, p. 60, 1829. A name first applied to the northern wolves, but subsequently used for widely different animals. The essential part of Richardson's original account, so far as geography is concerned, is as follows:

The Common Wolves of the Old and New World have been generally supposed to be the same species—the *Canis lupus* of Linnæus. The American

(for use of this name for the eastern timber-wolf, see Miller, Proc. Biol. Soc. Washington, Vol. 25, p. 95, May 4, 1912), and the narrowing of the rostrum is not carried to so great an extreme. The type agrees in size and in the character of the teeth with the specimen from northwest of Fort Yukon marked male by McKay.

¹In a note recently published (Proc. Biol. Soc. Washington, Vol. 25, p. 95, May 4, 1912), I came to the same conclusion by a different course of reasoning.

naturalists have, indeed, described some of the northern kinds of Wolf as distinct; but it never seems to have been doubted that a Wolf, possessing all the characters of the European Wolf, exists within the limits of the United States. The wolf to which these characters have been ascribed, seems to be the "large brown Wolf" of Lewis and Clark, and, according to them, inhabits not only the Atlantic countries, but also the borders of the Pacific and the mountains which approach the Columbia River, between the Great Falls and rapids, but is not found on the Missouri to the westward of the Platte. I have seen none of these *Brown Wolves*; but if their resemblance is so close to the European Wolf as Major Smith states it to be, I have no hesitation in saying that they differ decidedly from the Wolf which inhabits the countries north of Canada. . . . I have, therefore, in the present state of our knowledge, considered it unadvisable to designate the northern Wolf of America by a distinct specific appellation, lest I should unnecessarily add to the list of synonyms, which have already overburthened the science of Zoölogy. The word *occidentalis*, which I have affixed to the Linnæan name of *Canis lupus*, is to be considered as merely marking the geographical position of the peculiar race of Wolf which forms the subject of this article. I have avoided adopting, as a specific name, any of the appellations founded on color, because they could not with propriety be used to denote more than casual varieties of a species, in which the individuals show such a variety in their markings.

In a later article (Rep. Brit. Asso. Adv. Sci., Vol. 5, pp. 145-146, 1837) Richardson says: "The *Lupus occidentalis* travels northward to the islands of the Arctic Sea, but its southern range cannot be defined until its identity with the common wolf of the United States be proved or disproved." It is evident from this that the name was intended to apply to the Canadian wolves met with by the author. Richardson visited parts of the ranges of all three types of northern wolves (see Preble, North Amer. Fauna, No. 27, pp. 57-60, October 26, 1908). There is nothing in his first account or in his subsequent allusions to the animal, that can be used to gain further insight of his intention, or to allocate the name artificially. The application of the name must, therefore, be determined by subsequent revision. Up to the present time, however, no one has in a technical sense acted as reviser; the name has merely been applied to various animals, frequently unknown at first-hand to Richardson, and without definite knowledge on the part of the persons so using it of the three types of central Canadian wolves.¹

¹ As examples of such applications may be cited: to *Canis lycaon* by DeKay in 1842 (Nat. Hist. New York, Vol. 1, p. 42); to a combination of *C. gigas* and *C. lycaon* by Peale in 1848 (U. S. Expl. Exped., Vol. 8, p. 26); to *C. nubilus* by Townsend in 1850 (Journ. Acad. Nat. Sci. Philadelphia, N. S., Vol. 2, pp. 77-79); to a probable combination of *C. lycaon* and *C. tundrarum* by Bangs in 1898 (Amer. Nat., Vol. 32, p. 505, July, 1898); to the timber-wolf of the northern interior region by Preble in 1908 (North Amer. Fauna, No. 27, p. 211, October 26, 1908).

Under the circumstances, the name requires a definite restriction, and I shall follow Preble in limiting it to the northern timber-wolf. This animal is represented in the U. S. National Museum by skulls from Fort Simpson which show it to be the largest American wolf yet known.¹

Pambasileus.—*Canis pambasileus* Elliot, Proc. Biol. Soc. Washington, Vol. 18, p. 79, February 21, 1905. Type locality, Sushitna River, region of Mt. McKinley, Alaska. So far as can be judged from the description, this is a local form of *Canis occidentalis* not attaining the extreme size of the Canadian animal.

Sticte.—(*Canis lupus, occidentalis*) var. *C. Lupis sticte* Richardson, Fauna Boreali Americana, Vol. 1, p. 68, 1829. Like *ater* this name is a synonym of *occidentalis*.

Variabilis.—*Canis variabilis* Wied, Reise in das innere Nord Amerika, Vol. 2, p. 95, 1841. Type locality, Fort Clark, near present town of Stanton, Mercer County, North Dakota. A synonym of *nubilus*.

The forms that seem worthy of recognition are, with their synonyms, as follows:

1. **CANIS TUNDRARUM** Miller (Barren Grounds).

albus Sabine 1823.

occidentalis Richardson 1829 (part).

albus Preble 1908.

2. **CANIS OCCIDENTALIS** Richardson (Northern Interior Forests).

griseus Sabine 1823.

occidentalis Richardson 1829 (part).

ater Richardson 1829.

sticte Richardson 1829.

occidentalis Preble 1908.

3. **CANIS PAMBASILEUS** Elliot (Region of Mt. McKinley).

4. **CANIS GIGAS** Townsend (Region of Puget Sound).

occidentalis Peale 1848 (not of Richardson).

5. **CANIS NUBILUS** Say (Interior Plains).

occidentalis Richardson 1829 (part).

occidentalis Townsend 1850.

variabilis Wied 1841.

¹ Cranial measurements of adult male, No. 9001: condylobasal length, 266; greatest length, 282.5; zygomatic breadth, 155.5; mandible, 208; maxillary tooththrow, exclusive of incisors, 116.5; mandibular tooththrow, exclusive of incisors, 134.2; upper carnassial, 30.2 x 16.0; lower carnassial, 33.6 x 13.0.

Names which do not require consideration in this connection are:

Canis floridanus Miller 1912 (Proc. Biol. Soc. Washington, Vol. 25, p. 95, May 4, 1912). Type locality, Horse Landing, on the St. John River, about 12 miles south of Palatka, Putnam County, Florida.

Canis frustror Woodhouse 1851 (Proc. Acad. Nat. Sci. Philadelphia, Vol. 5, p. 147). Type locality, Fort Gibson, at junction of Neosho and Arkansas rivers, Indian Territory.

Canis lycaon Schreber 1776 (Säugethiere, pl. 89.) Type locality, Eastern Canada.

Canis lupus var. *rufus* Audubon and Bachman 1851 (Quadr. North Amer., Vol. 2, p. 240. Type locality, Texas. (*Canis rufus* Bailey, North Amer. Fauna, No. 25, p. 174, October 24, 1905.)

Canis mexicanus Linnæus 1766 (Syst. Nat., Vol. 1, 12th ed., p. 60). Type locality, southern Mexico. The name was primarily based on the "Xoloitzcuintli" of Hernandez (Rerum Medicarum Novæ Hispaniæ Thesaurus, p. 479, 1628), an animal described as very similar to the European wolf and considerably larger than the "Coyotl." It inhabited the hot portions of Mexico (Hernandez, Hist. Anim. et Min. Nov. Hisp., Tractatus primus, De Quadr. Nov. Hisp., p. 7). Whether a true wolf ever occurred in this region is doubtful. Mr. E. W. Nelson informs me that the wolf of the southern end of the Mexican tableland became extinct about fifty years ago.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

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NEW RODENTS FROM BRITISH EAST AFRICA

BY

EDMUND HELLER

Naturalist, Smithsonian African Expedition



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NEW RODENTS FROM BRITISH EAST AFRICA

By EDMUND HELLER

NATURALIST, SMITHSONIAN AFRICAN EXPEDITION

During the year just closed the writer accompanied Mr. Paul J. Rainey's hunting party through British East Africa, for the purpose of preserving the animals obtained by the expedition. The collections thus secured have been donated by Mr. Rainey to the Smithsonian Institution, under whose auspices the natural history work was accomplished.

The collecting operations were limited chiefly to the preservation of the mammals, special attention being devoted to the collecting of the large carnivores and ungulates. The collection of mammals secured under Mr. Rainey's direction and coöperation is of immense size, the number of specimens aggregating some four thousand, more than seven hundred of which are specimens of big game. This additional material will add greatly to the facility of classifying the African collection made by the Smithsonian African Expedition under direction of Colonel Roosevelt two years ago, and which is now under investigation by the writer. It is, however, deemed advisable to publish at once any new species which may be detected while the work is in progress.

The present paper consists of descriptions of the new races of rodents found in the Rainey collection.¹ It would not, however, have been possible to determine this material without direct comparison with the types and specimens in the British Museum. For the privileges of making such comparisons the writer is under obligations to Mr. Oldfield Thomas, the curator in charge of the mammal collections. Mr. Thomas has labored with such marked success in accumulating and describing mammal material from Africa, that no satisfactory systematic work can be accomplished without direct reference to the immense collection under his charge at the Natural History Museum.

¹ For the sake of convenience a single form from Uganda is included.

PROTOXERUS STANGERI BEA, new subspecies**GIANT FOREST SQUIRREL**

Type from Lukosa River, Kakumega Forest, British East Africa; adult male, number 181786, U. S. Nat. Mus.; collected by Edmund Heller, February 8, 1912; original number, 5614.

Characters.—Allied to *centricola*, and of the same size, but dorsal coloration much lighter; the rump and hind limbs bright ferruginous; head lighter purer gray; throat white, not grayish, the hairs almost wholly white, only dark at extreme base.

Coloration.—General dorsal coloration tawny-olive, becoming bright cinnamon-rufous on rump and hind limbs; crown and fore limbs tawny-olive like back, rest of head and the ears grayish; the hair everywhere on dorsal surface showing black speckling, due to annulation, the individual hairs of back black tipped, with a broad subterminal band of tawny and a black base. Sides of body like back; a broad band of gray hairs bordering belly. The under parts very thinly haired, and sharply defined on sides by the band of long gray hairs; belly ochraceous; the hair on chest and throat whitish to the roots; fore limbs tawny-ochraceous; hind limbs ochraceous-rufous. Tail above blackish, banded by fifteen transverse bands of grayish, extreme base of tail cinnamon-rufous, like rump; the individual hairs with gray tips, broad black subterminal band followed by a narrower gray band, which is succeeded by a black one of equal width and a gray basal band; tail below, without distinct transverse bands, the hairs annulated with gray and black in about equal proportion.

Measurements.—Head and body, 270 mm.; tail, 290; hind foot, 66; ear, 20. Skull: greatest length, 68; condylo-incisive length, 60.4; basilar length, 51.8; zygomatic breadth, 39.6; interorbital constriction, 20.6; nasals, 19; palatilar length, 29; palatal foramina, 4; diastema, 16.6; maxillary toothrow, 11.6; condylo-incisive length of mandible, 45.4; coronoid-angular depth of mandible, 26.

A large series of specimens from the type locality shows some variation in the depth of the general coloration, but the darkest is considerably lighter than any specimens of *centricola* examined.

GRAPHIURUS MURINUS JOHNSTONI, new subspecies**UARAGESS DORMOUSE**

Type from Mt. Gargues (Uaragess), Mathews Range, British East Africa; altitude, 7000 feet; adult male, number 181787, U. S.

Nat. Mus.; collected by Edmund Heller, August 26, 1911; original number, 4114.

Characters.—Closely allied to *saturatus*, but feet wholly white; ears larger, and general tone grayer; skull differs by longer palatal foramina.

Coloration.—Dorsal coloration hair-brown; sides of head and body drab, the orbital ring and base of whiskers black; feet white; ears broccoli-brown, thinly haired; underparts buffy, chin white, the hair everywhere plumbeous at base; tail broccoli-brown above, slightly paler below, the tip white.

Measurements.—Head and body, 92 mm.; tail, 80; hind foot, 18; ear, 17. Skull: greatest length, 28.4; condylo-incisive length, 25; basilar length, 22; zygomatic breadth, 15; interorbital constriction, 5; palatilar length, 8.5; palatal foramina, 3.8; nasals, 10.5 x 3.4; diastema, 6.2; maxillary toothrow, 3.3; condylo-incisive length of mandible, 15.8; coronoid-angular depth of mandible, 7.5.

This dormouse is confined to the forested summits of the higher mountains of the Mathews range. Specimens were secured on both Uaragess and Lololokui. Named for Dr. M. E. Johnston, who accompanied the Rainey safari, and to whom the writer is indebted for much assistance.

GRAPHIURUS MURINUS ISOLATUS, new subspecies

TAITA FOREST DORMOUSE

Type from Mt. Umengo, Taita Mountains, British East Africa; altitude, 5000 feet; adult female, number 181788, U. S. Nat. Mus.; collected by Edmund Heller, November, 1911; original number, 4719.

Characters.—Closely resembling *saturatus* in color, but grayer above with larger feet and ears; skull very different, the nasals much longer, the cheek teeth decidedly heavier, and the mesopterygoid fossa and palate much wider.

Coloration.—Above Prout's brown, the median dorsal region darker, almost seal-brown; sides lighter raw umber, cheeks and lower sides bordered by ochraceous-buff; the orbital ring and base of whiskers black; ears broccoli-brown; feet chiefly white, only a median streak dark; underparts ochraceous-buff, the hair plumbeous basally, except on chin where it is uniform buffy; tail broccoli-brown above, slightly lighter below with the tip white.

Measurements.—Head and body, 95 mm.; tail, 90; hind foot, 19; ear, 16. Skull: greatest length, 28; condylo-incisive length, 24.5;

basilar length, 21; zygomatic breadth, 15.3; interorbital constriction, 4.5; nasals, 11.2 x 3.5; palatilar length, 8.9; palatal foramina, 3.2; diastema, 6; maxillary tooththrow, 3.6; condylo-incisive length of mandible, 16.8; coronoid angular depth of mandible, 7.5.

This race is confined to the forested summits of the Taita Mountains.

LOPHIOMYS THOMASI, new species

UARAGESS MANED RAT .

Type from Mt. Gargues (Uaragess), 6000 feet altitude, Mathews Range, British East Africa; adult male, number 181789, U. S. Nat. Mus.; collected by Edmund Heller, September 1, 1911; original number, 4206.

Characters.—Allied most closely to *ibeanus*, differing chiefly in darker and more contrasting coloration; head with median black area bounded by wide white bands above eye, which are continuous over forehead; skull nearest *ibeanus* in shape and size but mesopterygoid fossa intermediate in size between this species and *testudo*, size of antorbital foramen and granulation of maxillary as in *ibeanus*, from which it differs by thicker outer walls to antorbital foramen, larger masseteric knob and smaller palatal foramina.

Coloration.—General dorsal coloration deep black, the hairs everywhere broadly white tipped, giving a silvery effect; the sides somewhat more extensively white than the median maned area; the short haired lateral bands bordering the mane olive-drab, in marked contrast to the general coloration. Head chiefly black with two prominent wide white bands over eyes, which meet on forehead, another large white spot below eye, setting off the black eye area and the black snout; ears hidden in the hair, blackish inside, their backs and tips white. Hind and forelimbs silvered like back, the toes, however, chiefly black. Underparts grayish, the hairs extensively white tipped, the underfur smoke-gray; chin black, the throat lighter and chiefly white; tail silvered like dorsal region, the extreme tip white.

Measurements.—Head and body, 270 mm.; tail, 165; hind foot, 41; ear, 26. Skull: tip of nasals to back of interparietal, 58; condylo-incisive length, 57; basilar length, 51; zygomatic breadth, 38; interorbital constriction, 14; nasals, 20.5 x 8; height of antorbital foramen, 7; palatilar length, 27.5; palatal foramina, 10; maxillary tooththrow, 13; diastema, 14.5; length of mesopterygoid fossa, 12.5;

condylo-incisive length of mandible, 40; coronoid-angular depth of mandible, 17.

Three specimens are in the collection from the type locality. They agree minutely in coloration and size. I take pleasure in naming this new race for Mr. Oldfield Thomas, to whose investigations are due the discovery and description of the great bulk of East African mammals.

OTOMYS ORESTES DOLLMANI, new subspecies

UARAGESS VELDT RAT

Type from Mt. Gargues (Uaragess), Mathews Range, British East Africa, altitude, 7000 feet; adult male, number 181790, U. S. Nat. Mus.; collected by Edmund Heller, August 27, 1911; original number, 4125.

Characters.—Closely allied to *orestes*, and having six laminæ to last upper molar, but skull narrower at interorbital region, which is less beaded and arched, with markedly smaller bullæ; coloration dark olive like *tropicalis*.

Coloration.—Dorsal color uniform bister, the sides lighter Vandyke brown; ears black; feet dark gray; underparts grayish, with raw umber suffusion, the hair basally plumbeous.

Measurements.—Head and body, 150 mm.; tail, 88; hind foot, 25; ear, 21. Skull: greatest length, 37.4; condylo-incisive length, 34; basilar length, 29.2; zygomatic breadth, 18.1; interorbital constriction, 4.9; nasals, 17.2 x 7; diastema, 8.5; post palatal length, 12; palatal foramina, 6.6; maxillary toothrow, 8.1 (alveolar) 7 (crowns); condylo-incisive length of mandible, 12.3; coronoid-angular depth of mandible, 13.2.

Five specimens were secured in the forests glades at the extreme summit of Mt. Uaragess. These all agree in laminar formulæ with the type. Named for Mr. Guy Dollman, who has studied extensively the collections of East African mammals at the British Museum.

DENDROMUS MESOMELAS PERCIVALI, new subspecies

UARAGESS TREE MOUSE

Type from Mt. Gargues (Uaragess), Mathews Range, British East Africa, altitude, 7000 feet; adult female, number 181791, U. S. Nat. Mus.; collected by A. Blayney Percival, August 26, 1911; Heller number, 4100.

Characters.—Closely allied to *insignis*, but differing in buffy belly and yellowish tone to upper parts, without any of the russet color so characteristic of that form; skull similar to *insignis*, but palatal foramina not elliptical, widest posteriorly and triangular in shape.

Coloration.—General dorsal coloration tawny, becoming light on the sides where it is tawny-ochraceous; median dorsal region from middle of back to base of tail marked by a wide black streak; orbital region blackish; ears broccoli-brown; feet white; underparts ochraceous-buff, the hair plumbeous basally; chin whitish, the hair light to the roots; tail broccoli-brown above, whitish below, the underside marked by a faint median dark streak separating the white, and extending nearly to the tip.

Measurements.—Head and body, 86 mm.; tail, 105; hind foot, 20; ear, 16. Skull: greatest length, 25; condylo-incisive length, 22.2; basilar length, 18.8; zygomatic breadth, 12.3; interorbital constriction, 3.3; nasals, 9 x 3; palatilar length, 10.5; palatal foramina, 5.4; diastema, 6.4; maxillary tooththrow, 4, condylo-incisive length of mandible, 14.3; coronoid-angular depth of mandible, 7.

Named for Mr. A. Blayney Percival, Game Ranger of British East Africa, to whom the writer is greatly indebted for assistance and companionship while at Mt. Uaragess.

DENDROMUS WHYTEI CAPITIS, new subspecies

LOLOLOKUI TREE MOUSE

Type from Mt. Lololokui, Mathews Range, British East Africa, altitude, 6000 feet; adult female, number 181792, U. S. Nat. Mus.; collected by Edmund Heller, September 8, 1911; original number, 4263.

Characters.—Similar to *pallescens*, but tail longer, feet larger and more whitish; skull wider interorbitally and larger toothed than *pallescens*.

Coloration.—Median dorsal color raw umber; sides lighter, tawny; feet ochraceous, the toes white; ears raw umber; hair of underparts pure silky white to the roots, in contrast to the ochraceous sides; tail uniform broccoli-brown.

Measurements.—Head and body, 60 mm.; tail, 88; hind foot, 16.5; ear, 13. Skull: greatest length, 20; condylo-basal length, 17.7; basilar length, 14.8; zygomatic breadth, 10.7; interorbital constriction, 3.2; nasals, 7 x 2.4; palatilar length, 8.2; palatal slits, 4; diastema, 5; maxillary tooththrow, 3.3; condylo-incisive length of mandible, 11.7; coronoid-angular depth of mandible, 5.6.

Only the type was secured on Lololokui. Mount Lololokui is a gigantic table mountain which has received its Samburr name, Lololokui, or head, from its commanding southern face, which rises vertically as a sheer precipice three thousand feet above the plain it dominates.

LOPHUROMYS AQUILUS MARGARETTÆ, new subspecies

UARAGESS HARSH-FURRED MOUSE

Type from Mt. Gargues (Uaragess) Mathews Range, 6000 feet altitude, British East Africa; adult male, number 181793, U. S. Nat. Mus.; collected by Edmund Heller, August 27, 1911; original number, 4126.

Characters.—Allied to *zena*, but smaller, darker colored and longer tailed; the absence of light speckling gives this race a similar dark dorsal color to *rubecula*, but it is smaller in size with darker feet; skull smaller than *zena*, with smaller teeth and bullæ and flatter interorbital region.

Coloration.—Dorsal color seal brown, the sides of head and body lighter Vandyke brown; russet speckling very slight, only evident on head and sides of body; feet hair brown; the toes and tarsal region whitish; ears blackish; underparts tawny-ochraceous, with a slight dusky clouding, sharply contrasted with the dark sides. Tail bicolor, seal brown above, below whitish.

Measurements.—Head and body, 120 mm.; tail, 80; hind foot, 21; ear, 18. Skull: greatest length, 30; condylo-incisive length, 29; basilar length, 25; zygomatic breadth, 15; interorbital constriction, 6; nasals, 12.2 x 3; palatilar length, 13.3; palatal foramina, 6.8; diastema, 8.2; maxillary toothrow, 5.3; condylo-incisive length of mandible, 20.4; coronoid-angular depth of mandible, 9.

The large series of topotypes is remarkably uniform in dorsal color and size, but shows the usual color variation of the underparts from fulvous and buffy tints to dark vermiculated patterns.

EPIMYS ALLENI KAIMOSÆ, new subspecies

KAKUMEGA PYGMY FOREST MOUSE

Type from Kaimosi, Kakumega Forest, British East Africa; adult female, number 181794, U. S. Nat. Mus.; collected by Edmund Heller, February 1, 1912; original number, 5527.

Characters.—Size of *stella*, but ears much larger and pelage longer, the dorsal area less reddish, and black orbital ring continuous with a black band to tip of snout. Skull size of *stella*, but

palatal foramina wider and extending further posteriorly; mesopterygoid fossa considerably narrower.

Coloration.—Dorsal area russet, the median region only slightly darkened by black lining; sides bright cinnamon, and contrasting sharply with the light underparts; ears blackish; tail uniform broccoli-brown; hind feet drab, the toes white; fore feet white.

Measurements.—Head and body, 86 mm.; tail, 135; hind foot, 17.5; ear, 16. Skull: greatest length, 25; condylo-basal length, 23; basilar length, 19.8; zygomatic breadth, 12.5; interorbital constriction, 4.8; nasal length, 8.8; palatilar length, 11; diastema, 7; maxillary toothrow, 3.8; palatal foramina, 5; condylo-incisive length of mandible, 16.5; coronoid-angular depth of mandible, 7.

Two others were secured besides the type in the depths of the Kakumega Forest. This race is one of the *alleni* group which are known only in the Congo forest and its extensions. The range of this group coincides with that of the potto and the Uganda duiker, which attain their extreme eastern limit in the Kukumega Forest.

EPIMYS COUCHA NEUMANI, new subspecies

LONG-TAILED MULTIMAMMATE MOUSE

Type from Neuman's Boma, Northern Guaso Nyiro River, British East Africa; number 181795, U. S. Nat. Mus.; collected by Edmund Heller, September 26, 1911; original number, 4372.

Characters.—Similar to *panya*, but tail much longer than head and body; skull more arched at interorbital region, and bullæ smaller.

Coloration.—Dorsal area hair brown, the mid dorsal region lined heavily with black; sides buffy gray, the lower sides bordered by a buffy band; ears blackish; tail uniform broccoli-brown; feet white; underparts buffy, the hair basally plumbeous.

Measurements.—Head and body, 115 mm.; tail, 128; hind foot, 25. Skull: greatest length, 30.5; condylo-incisive length, 28.3; basilar length, 24.7; zygomatic breadth, 14.5; interorbital constriction, 4; nasals, 12.3 x 3; palatilar length, 14; palatal foramina, 7; diastema, 8.3; maxillary toothrow, 5; condylo-incisive length of mandible, 20.2; coronoid-angular depth of mandible, 9.

Three other specimens are in the collection from the type locality, and all agree with the type in the possession of long tails.

Mr. A. H. Neuman, who has written so entertainingly about elephant hunting, lived for several years at the spot on the Guaso Nyiro, where the specimens were secured.

EPIMYS COUCHA DURUMÆ, new subspecies**SWAHILI MULTIMAMMATE MOUSE**

Type from Mazeras, British East Africa; adult male; number 181796, U. S. Nat. Mus.; collected December 23, 1911, by Edmund Heller; original number, 5002.

Characters.—Closely allied to *hildebrandti*; differs in much grayer and lighter coloration, in narrower and more attenuate mesopterygoid fossa and smaller bullæ.

Coloration.—Dorsal color hair-brown, with slight black lining to mid dorsal region; sides of head and body drab gray, the lower sides bordered by a buffy streak; ears and tail broccoli-brown; feet white; underparts pearl-gray, with a faint buffy suffusion medially; hair plumbeous at base, except on chin, where it is uniform white.

Measurements.—Head and body, 135 mm.; tail, 118; hind foot, 24; ear, 19. Skull: greatest length, 32; condylo-incisive length, 31; basilar length, 27; zygomatic breadth, 15.5; interorbital constriction, 45; nasals, 13.3 x 3.5; palatilar length, 15; palatal foramina, 7.7; diastema, 8.5; maxillary toothrow, 5.4; condylo-incisive length of mandible, 22; coronoid-angular depth of mandible, 10.

A large series are in the collection from Mazeras, Mariakani and Maji-ya-chumvi. They are readily distinguished by their gray tone from a series of *hildebrandti* from the Taita district.

EPIMYS TAITÆ, new species**TAITA FOREST MOUSE**

Type from Mt. Mbololo, Taita Mountains, British East Africa, 5000 feet altitude; adult male; number 181797, U. S. Nat. Mus.; collected by Edmund Heller, November 5, 1911; original number, 4611.

Characters.—Allied most closely to *peromyscus*, but much smaller in size, with shorter ears; skull differs decidedly in lacking beads to interorbital edges, which are rounded, and in the shorter palatal foramina, which reach only anterior edge of first molar.

Coloration.—Dorsal area russet, darkest medially; sides lighter cinnamon, and sharply contrasted with light underparts; ears and tail broccoli-brown; feet white; underparts whitish, with a cream-buff suffusion; the hair plumbeous basally.

Measurements.—Head and body, 105 mm.; tail, 138; hind foot, 23; ear, 19. Skull: greatest length, 29; condylo-basal length, 26; basilar length, 12.4; zygomatic breadth, 13.8; interorbital constriction, 4.3; nasals, length, 11.9; post palatal length, 10; palatal for-

amina, 6.2; maxillary toothrow, 4.5; diastema, 7.6; condylo-incisive length of mandible, 17; coronoid-angular depth of mandible, 8.2.

A large series of topotypes were secured, and others were collected on a neighboring mountain, Umengo. They inhabit only the heavy forests found on a few of the higher summits of the Taita Mountains. Geographically they are isolated by many miles of desert from their nearest allies of the highland forests of Mt. Kenia and the Kikuyu Escarpment.

ZELOTOMYS HILDEGARDÆ VINACEUS, new subspecies

TAITA BROAD-HEADED MOUSE

Type from Ndi, Mt. Mbololo, Taita Mountains, British East Africa, altitude 3000 feet; adult female; number 181798, U. S. Nat. Mus.; collected by Edmund Heller, November 4, 1911; original number, 4578.

Characters.—Similar to *hildegardæ*, differing in lighter dorsal coloration, more whitish underparts and tail, and shorter pelage; mesopterygoid fossa narrower, and incisors lighter colored.

Coloration.—Dorsal color wood brown, the median region lined sparingly with black; sides more buffy, and becoming pure buff where they meet the light underparts; feet white; ears broccoli-brown; tail white, with a narrow mid dorsal streak of drab; underparts cream-buff, the hair everywhere plumbeous basally.

Measurements.—Head and body, 117 mm.; tail, 98; hind foot, 22.5; ear, 16. Skull: greatest length, 29.2; condylo-incisive length, 29.5; basilar length, 25.7; zygomatic breadth, 16.5; interorbital constriction, 5; nasals, 11.8 x 3.2; diastema, 9.2; palatal foramina, 7.5; post palatal length, 11.4; maxillary toothrow, 5.5; condylo-incisive length of mandible, 23; coronoid-angular depth of mandible, 9.5.

Three specimens secured in the vicinity of Ndi. They agree closely with the type. In life the tail, which is quite hairless, is a delicate vinaceous-pink, and by this character alone it is readily distinguishable from *Epinys coucha hildebrandti*, with which it agrees closely in pelage and size, and with which it is associated.

THAMNOMYS DOLICHURUS LITTORALIS, new subspecies

SWAHILI TREE RAT

Type from Mazeras, British East Africa; adult male; number 181799, U. S. Nat. Mus.; collected by Edmund Heller, December 22, 1911; original number, 4949.

Characters.—Closely allied to *polionops*; differs chiefly in possession of white feet and underparts, the dorsal area lighter and less russet, and the flanks salmon-gray; size greater, skull with smaller molars; compared to *surdaster*, the skull has smaller bullæ, and a longer rostrum.

Coloration.—Dorsal coloration russet, the median region heavily black lined; rump lighter and more cinnamon in tone; head tawny-brown; sides of body and hind limbs salmon-gray, fore and hind feet white; underparts white; the hair white to the roots, tail uniform broccoli-brown.

Measurements.—Head and body, 120 mm.; tail, 160; hind foot, 23. Skull: greatest length, 31.2; condylo-incisive length, 28.3; basilar length, 24.3; zygomatic breadth, 15; interorbital constriction, 5; nasals, 11.5 x 3; post palatal length, 11.4; diastema, 8; palatal foramina, 7; maxillary toothrow, 4.5; condylo-incisive length of mandible, 19.3; coronoid-angular depth of mandible, 9.5.

The type is the only specimen secured. An examination of the members of the genus *Thamnomys* for generic characters shows that only the type species *venustus* and *rutilans* possess the extra internal cusps to the molars in a worn mature stage. It is only possible in young unworn teeth of the *dolichurus* group to distinguish the ridge which marks this cusp. The long tufted tail, and the tree dwelling habits are possessed by *Epimys nigricauda* and its allies, and the external tail characters by the *E. vereauxi* group, but the skulls of these species show no trace of the extra cusp.

LEMNISCOMYS PULCHELLUS SPERMOPHILUS, new subspecies

UARAGESS SPOTTED GRASS RAT

Type from Mt. Gargues (Uaragess) Mathews Range, British East Africa, altitude 7000 feet; adult female; number 181800, U. S. Nat. Mus.; collected by Edmund Heller, August 26, 1911; original number, 4103.

Characters.—Closely allied to *massaicus*, but dorsal coloration lighter and without rusty suffusion; foot smaller; skull differs from *massaicus* by greater concavity to the antorbital plate, and more prominent hook at the angle; teeth and bullæ larger.

Coloration.—Dorsal color dark olive, banded by ten light longitudinal bands or series of spots of ochraceous, the median lines enclosing a black stripe; head tawny-olive; ears olive, with long rusty hairs about base; sides lighter, the spots becoming wide blotches of buff, and merging into the buffy wash of the underparts;

underparts whitish, suffused by cream-buff; hairs on throat and midline of belly white to the roots; tail sharply bicolor, sepia above, buff below.

Measurements.—Head and body, 120 mm.; tail, 139; hind foot, 26; ear, 17. Skull: greatest length, 30.5; condylo-incisive length, 28.4; basilar length, 24.3; zygomatic breadth, 14.3; interorbital constriction, 5; nasals, 11.2 x 3.3; palatilar length, 13.5; palatal foramina, 6; diastema, 7.8; maxillary toothrow, 5.4; condylo-incisive length of mandible, 19.6; coronoid-angular depth of mandible, 11.4.

A large series secured in the forest near the summit of Mt. Uaragess, to which elevated region this rat is confined.

The group of *Arvicanthis*, to which the name *Lemniscomys* has been applied, can be separated from the uniformly colored species of the *abyssinicus* type by their striped or spotted coloration, and the shape of the antorbital plate, which is deeply concave in front with a prominent hook at the angle, as in *Dasymys*. This bone in the *abyssinicus* group is rounded at the angle without any concavity to its border.

PELOMYS FALLAX IRIDESCENS, new subspecies

TAITA CREEK RAT

Type from Mt. Mbololo, Taita Mountains, altitude 5000 feet; adult male; number 181801, U. S. Nat. Mus.; collected by Edmund Heller, November 5, 1911; original number, 4620.

Characters.—Allied most closely to *fallax*, but differs in the heavier dorsal stripe; strong suffusion of buffy on the chest; narrower nasals and broader interorbital region.

Coloration.—General dorsal color golden-olive, lined with black, the whole suffused by an olive-green iridescence, the median dorsal region with a well defined black streak from nape to base of tail; sides of head and body lighter golden, the color carried low down on sides, where it merges gradually into the golden-ochraceous of the chest; ears on outer side blackish, brownish within; hind feet, buffy; fore feet golden-olive; tail bicolor, black above, tawny below; underparts with chest suffused with golden-ochraceous; chin and throat whitish; the belly buff; the hair everywhere plumbeous basally.

Measurements.—Head and body, 140 mm.; tail, 140; hind foot, 31.5; ear, 18. Skull: greatest length, 36; condylo-basal length, 33.5; basilar length, 29; zygomatic breadth, 18.3; interorbital constriction, 6; nasals, 14.3 x 4; post palatal length, 12.1; palatal

foramina, 6.7; diastema, 9.8; maxillary tooththrow, 7; condylo-incisive length of mandible, 22.6; coronoid-angular depth of mandible, 12.6.

It is surprising to find a form with so conspicuous a dorsal stripe living at the northern extremity of the range of the genus, with the intermediate geographical form unstriped.

A large series is in the collection from the summits of the Taita Mountains, and a few also from the base of the range where they are much rarer.

PELOMYS FALLAX CONCOLOR, new subspecies

UGANDA CREEK RAT

Type from Kiduha, Lake Mutanda, Uganda; adult male; number 11.12.3.344, Brit. Mus.; collected June 25, 1911, by Robin Kemp; original number, 2307.

Characters.—Resembling *insignatus* in lacking a dark dorsal stripe, but differs in more uniform and darker coloration to under surfaces, in narrower nasals, and longer tooththrow and palatal foramina. From *iridescens* it differs in lack of the dorsal stripe, in the absence of white on throat and belly, and also in the narrower inter-orbital constriction, larger palatal foramina and bullæ, and shorter tail.

Coloration.—Dorsal area bister, with some black lining, the bister gradually brightening on head and sides of body to golden-olive, with but little black lining; ears blackish, the long hairs at the base rusty; feet tawny-olive, like the underparts; underparts uniformly tawny-olive, and scarcely lighter than the golden-olive of the sides, the hair plumbeous at base; tail sharply bicolor, black above, tawny-olive below.

Measurements.—Head and body, 146 mm.; tail, 137; hind foot, 29.5; ear, 18. Skull: greatest length, 36; condylo-incisive length, 33; basilar length, 29; zygomatic breadth, 17.3; interorbital constriction, 5.8; nasals, 14 x 4.5; palatilar length, 15.7; diastema, 9; palatal foramina, 7.3; maxillary tooththrow, 7; condylo-incisive length of mandible, 22; coronoid-angular depth of mandible, 12.

This species is closely related to the unstriped form *insignatus* of Nyasaland, and not closely to the Taita form which is an isolated mountain species. A large series of specimens is in the British Museum from Uganda, and Lake Kivu on the western frontier of German East Africa. These specimens agree well in their uni-

formly dark underparts and lack of contrast to the color of the dorsal surfaces.

In making an examination of the specimens from Uganda, two specimens of the group known as *Mylomys*, by Thomas, were discovered. These were taken at the same locality where the present type was secured. Externally they can be recognized by their longer tails and pure white underparts, but these differences only hold good with the *fallax* group. One of the Angola species, *P. campanæ*, has an equally long tail and similar white underparts to the members of the *Mylomys* division. This species also occurs with a member of the *P. fallax* group, over part, at least, of its range. An examination of the teeth, however, shows it to be a typical *Pelomys*, with short tubercles and with the third lower molar having in the second lamina only one, the inner cusp, which is enlarged. In *Mylomys* the cusps of the cheek teeth are higher, and the M_3 has besides the inner cusp of the second lamina, a small outer one as well, but it is minute and less developed than in the *Desmomys* group. The dental characters of *Mylomys* are slight, and are not accompanied by any marked external characters. Geographically, the two groups are only known to be associated in Uganda, and it is not unlikely that we have here only a single generic type to deal with.

I am indebted to Mr. Oldfield Thomas for the privilege of describing this new race.

SACCOSTOMUS ISIOLE, new species

SAMBURR POUCHED RAT

Type from the Isiola River, Northern Guaso Nyiro, British East Africa; adult female; number 181803, U. S. Nat. Mus.; collected by Edmund Heller, July 1, 1911; original number, 1908.

Characters.—Similar to *mearnsi*, but differing in longer tail, darker dorsal coloration and small post palatine pits like *umbri-venter*, from which latter it differs by shorter nasals, wider inter-orbital region and longer tail; mesopterygoid fossa narrow and more acutely pointed than in any other species.

Coloration.—Dorsal color drab, the median region black lined; head and sides light drab; ears blackish; feet white; underparts pearl-gray, contrasting little with the sides; hair basally plumbeous, except on chin and fore throat, where it is white to the roots; tail bicolor, sepia above, whitish below.

Measurements.—Head and body, 128 mm.; tail, 72; hind foot, 21; ear, 20. Skull: greatest length, 35; condylo-incisive length, 33.1; basilar length, 28.9; zygomatic breadth, 17.3; interorbital constriction, 5; nasals, 14.2 x 4.1; post palatal length, 11.3; diastema, 10; palatal foramina, 7.8; maxillary toothrow, 6.4; condylo-incisive length of mandible, 23.4; coronoid-angular depth of mandible, 12.

The series of topotypes varies considerably in the intensity of the dorsal color.

CRICETOMYS GAMBIANUS RAINEYI, new subspecies

SAMBURR GIANT RAT

Type from Mt. Gargues (Uaragess), altitude 6000 feet, Mathews Range, British East Africa; adult male; number 181804, U. S. Nat. Mus.; collected by Edmund Heller, August 31, 1911; original number, 4187.

Characters.—Most closely allied to *kenyensis*, but decidedly grayer and smaller, the gray of upper parts invading belly and producing uniformity in color; ear black, in contrast to gray dorsal region; proportion of dark and light portion of tail as in *kenyensis*, but the dark base quite black; hind feet extensively white, only a narrow median streak dark; differs from *luteus* in possession of dark underparts, with a tail showing only basal one-half dark, and in being generally much grayer and smaller; skull differs from both *kenyensis* and *luteus* by short palatal foramina and diastema and narrow palate and smaller bullæ.

Coloration.—Dorsal area drab-gray, the median region lined with black; head purer drab-gray, the orbital region and ears black; hind feet lighter, the toes and sides white, only the median portion blackish; fore feet chiefly whitish; sides of head and body purer drab-gray without any black lining, and merging gradually into the somewhat lighter drab-gray underparts; hairs on throat and midline of belly drab-gray to the roots, those on the sides show plumbeous basally. Basal one-half of tail deep black all around in marked contrast to the pure white terminal half.

Measurements.—Head and body, 315 mm.; tail, 375; hind foot, 65; ear, 40. Skull: greatest length, 70.5; condylo-incisive length, 65; basilar length, 57; zygomatic breadth, 33; interorbital width, 11; nasals, 28 x 9.2; palatilar length, 33.5; palatal foramina, 6.3; diastema, 21; maxillary toothrow, 12; condylo-incisive length of mandible, 48; coronoid-angular depth of mandible, 24.

One topotype is in the collection and another specimen from a neighboring mountain (Lololokui). These agree closely with the type in color and other characters.

CRICETOMYS GAMBIANUS ENGUIVI, new subspecies

TAITA GIANT RAT

Type from Mt. Umengo, Taita Mountains, British East Africa, altitude 5000 feet; adult female; number 181805, U. S. Nat. Mus.; collected by Edmund Heller, November 13, 1911; original number, 4741.

Characters.—Similar to *osgoodi*, but pelage darker and longer, and underparts less white; the chest with a dark blotch; dark basal part of tail three-fourths total length. Dorsal region color of *kenyensis*, but underparts white.

Coloration.—Dorsal area Prout's brown, merging gradually on sides to broccoli-brown, median portion black lined; ears and hind feet Prout's brown, like the back in color, the feet with whitish borders and toes; fore feet white. Underparts white, in contrast to the dark sides, the hair wholly white except on chest where it is plumbeous at base and forms a dark blotch. Basal three-fourths of tail sepia, terminal part white.

Measurements.—Head and body, 325 mm.; tail, 383; hind foot, 69; ear, 44. Skull: greatest length, 75; condylo-incisive length, 69; basilar length, 60; zygomatic breadth, 34.6; interorbital constriction, 11; nasals, 30.2 x 9.8; palatilar length, 36; palatal foramina, 8.8; diastema, 23.6; maxillary toothrow, 11.8; condylo-incisive length of mandible, 50; coronoid-angular depth of mandible, 24.6.

This is an abundant mammal in the Taita Mountains, where it lives in the forests which clothe the summits. It is used extensively by the Wataito tribe for food, and is known among them as *enguvi*. The large series in the collection shows remarkably little variation in color.

CRICETOMYS GAMBIANUS OSGOODI, new subspecies

SWAHILI GIANT RAT

Type from Mazeras, British East Africa; aged male; number 181806, U. S. Nat. Mus.; collected by Edmund Heller, December 20, 1911; original number, 7425.

Characters.—Dorsal coloration similar to *luteus*, but pelage much shorter, only 10 mm. in length on rump; underparts lighter than

luteus, pure silky white, without dark patch on chest; skull much smaller than *luteus*, with smaller bullæ and palatine foramina and narrower mesopterygoid fossa; skull wider zygomatically, with greater interorbital width than *kenyensis*.

Coloration.—Median dorsal area broccoli-brown, with slight black lining; sides of head and body fawn, in contrast to the dark median area; hind feet and rump mars-brown; the toes white; fore feet whitish, with fawn spots; ears broccoli-brown. Underparts pure silky white, in contrast to the fawn of the sides, the hairs everywhere white to the roots. Basal three-fifths of tail broccoli-brown, the terminal two-fifths white.

Measurements.—Head and body, 330 mm.; tail, 395; hind foot, 66; ear, 40. Skull: greatest length, 72.5; condylo-incisive length, 66.5; basilar length, 59.5; zygomatic breadth, 33; interorbital constriction, 10.5; nasals, 30.5 x 9.5; palatilar length, 34.8; diastema, 23; palatal foramina, 7.2; maxillary toothrow, 11.5; condylo-incisive length of mandible, 48; coronoid-angular depth of mandible, 23.2. Skull aged, the incisors being much shortened by wear, the points of the lower pair worn down horizontally, the whole of the usual vertical cutting points having been worn away. Three other specimens from Mazeras agree with the type in coloration and length of pelage. Named for Mr. Wilfred H. Osgood, to whose work on the mammals of British East Africa the writer is indebted for much assistance.

THRYONOMYS GREGORIANUS PUSILLUS, new subspecies

TAITA LESSER CANE RAT

Type from Ndi, Mt. Mbololo, British East Africa; adult female; number 181807, U. S. Nat. Mus.; collected by Edmund Heller, November 3, 1911; original number, 4853.

Characters.—Allied to *gregorianus*, but decidedly smaller and more grayish in coloration, with very little rusty suffusion; skull without post-orbital notch, the sides of the frontals straight, nasals narrow, maxillary tips projecting far posteriorly into frontals, cheek teeth and palate narrow; the skull approaches nearer *harrisoni*, but teeth, palate, and nasals much narrower.

Coloration.—General dorsal color mixed sepia and tawny, suffused with rusty on rump and hind limbs; dorsal area clothed by two sorts of hair, long wholly sepia ones, and slightly shorter ones,

with a broad subterminal band of buff; sides of head and body slightly lighter and lacking the long dark hairs, buffy rather than tawny in tone; limbs colored like the body; ears clothed with short, chiefly buffy hairs, showing narrow dark annulations; underparts vermiculated buffy and hair-brown, the individual hairs all tipped by a broad band of buff; chin and lips whitish; tail rusty at base, clothed above by tawny hairs, and below by buff ones.

Measurements.—Head and body, 370 mm.; tail, 115; hind foot, 61; ear, 29. Skull: greatest length, 71; condylo-incisive length, 63; basilar length, 55; zygomatic breadth, 45; interorbital constriction, 21; nasals, 24 x 12; palatilar length, 28.5; diastema, 15; palatal foramina, 8.5; maxillary toothrow, 15; condylo-incisive length of mandible, 46; coronoid-angular depth, 25.

Four specimens of this new race are in the collection, two of these are from the type locality, and the others are from Maji-ya-chunvi. It is a very small form, and confined to the desert country flanking the moist coast belt.

The large, widespread species, *T. swinderianus*, occurs in the littoral zone at the mouth of the Tana River, and no doubt extends southward along the coast to the cape region. There is at present, however, no record of its actual occurrence with the races of the smaller species allied to *gregorianus*.

LEPUS RAINEYI, new species

MARSABIT HARE

Type from Longaya Water, 30 miles south of Mt. Marsabit, British East Africa; adult female; number 181808, U. S. Nat. Mus.; collected by Paul J. Rainey, July 21, 1911; Heller number, 3061.

Characters.—Most closely allied to *crawshayi*, from which it differs in lighter coloration and lack of tawny on sides of body and rump; differs from *somalensis* by absence of vinaceous suffusion; general body color similar to *salæ*, but feet buffy with fulvous pads, not white with drab pads, as in that species.

Coloration.—General dorsal coloration buffy-gray, lined with black, the black heaviest over mid dorsal line; rump and sides purer gray, without any buffy suffusion; nape and feet ochraceous, the pads fulvous; head tawny-ochraceous, lined sparingly with black; ears ochraceous, edged on inner margin by long buffy fringe, the extreme tip blackish and the outer side at base bordered by white; underparts white, the hair white to the roots, except on the throat,

which is crossed by the broad buffy neckband; tail white, the dorsal surface with a wide black stripe extending from base nearly to tip.

Measurements.—Head and body, 480 mm.; tail, 95; hind foot, 105; ear from notch, 115. Skull: greatest length, 88; condylo-incisive length, 77; basilar length, 67; zygomatic breadth, 42; inter-orbital constriction, 17; nasals, 36.4 x 19; palatilar length, 31.4; palatal foramina, 22; diastema, 24; maxillary toothrow, 15; condylo-incisive length of mandible, 69.4; coronoid-angular depth of mandible, 39.

In the desert about Marsabit this hare was found in abundance living in the open sandy country, relying upon its pale coloration for protection, and not on cover like the highland race.

LEPUS KAKUMEGÆ, new species

KAKUMEGA HARE

Type from the Lukosa River, Kakumega Forest, British East Africa; adult female; number 181809, U. S. Nat. Mus.; collected by Edmund Heller, February 12, 1912; original number, 5644.

Characters.—Ears much shorter than *victoriæ*, less than 90 mm. from notch; pelage long and heavy, suffused extensively with tawny; black dorsal tail stripe covering whole upper surface of tail to the extreme tip, not white bordered and white tipped as in *victoriæ* and its allies.

Coloration.—General dorsal coloration raw sienna, heavily black lined over the greater part of the dorsal area, except on rump and sides, where tawny-ochraceous predominates; nape ochraceous-rufous; crown of head like back, showing considerable black; orbital region clear buffy without any darker vermiculation; ears darker than dorsal area on upper surface, black predominating over tawny, the fringe on inner border mixed black and tawny; extreme tip black, the outer border at base white; limbs tawny, the pads tawny-olive; belly and chin white, the hair white to the roots; throat and chest tawny, merging gradually on sides into the more rufous nape and forming a conspicuous wide neckband; tail white below, the whole dorsal surface covered by a wide black mantle from base to tip.

Measurements.—Head and body, 460 mm.; tail, 110; hind foot, 105; ear from notch, 88. Skull: greatest length, 91; condylo-incisive length, 78.6; basilar length, 68; zygomatic breadth, 41.6; interorbital

constriction, 18.4 nasals, 40 x 19; palatilar length, 32.4; palatal foramina, 23; diastema, 24.4; maxillary toothrow, 15.4; condylo-incisive length of mandible, 69.6; coronoid-angular depth of mandible, 40.

The type is the only specimen secured. Hares were only seen in the grassy glades and open hill-sides, on the upper edge of the forest at the base of the Nandi escarpment.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

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NEW DIPTERA FROM PANAMA

BY

J. R. MALLOCH

Bureau of Entomology, U. S. Department of Agriculture



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NEW DIPTERA FROM PANAMA¹

By J. R. MALLOCH

BUREAU OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE

The descriptions of new species included in this paper are taken from specimens in the U. S. National Museum collection which were collected by A. Busck of the Bureau of Entomology, in 1911, while a member of the Smithsonian Biological Survey of the Panama Canal Zone.

FANNIA VITTATA, new species

Male.—Black, thickly gray-dusted; eyes distinctly separated by a velvety-black stripe, eye-margins shining silvery white, orbital bristles extending three-fourths to ocelli, frons and epistome slightly produced, face and eye-margins silvered, antennæ with the basal two joints yellow, third joint mostly brown, twice as long as second, arista pale at base, nearly bare, distinctly longer than antennæ, palpi yellow; mesonotum thickly gray-dusted, with three brown stripes, the center one very narrow, complete, the outer pair broad, ceasing at beyond middle and interrupted at suture, dorsal bristles strong, four pairs of dorso-central macrochætæ, pleuræ gray-dusted, scutellum with a small brown mark at base on each side, four strong marginal bristles and a number of discal setæ, two of which, beyond middle, are stronger; abdomen rather short, broad at base and tapering towards apex, basal three segments mostly translucent yellow, with a distinct black dorsal stripe, and a spot on each side at posterior margin which is more or less coalescent with the central stripe, last segment more or less blackened, with a distinct dorso-central stripe and two rounded spots on posterior third, all segments more or less distinctly gray-dusted, with numerous hairs, and especially the last segment with strong apical bristles, hypopygium normal, the ventral organs not prominent, ventral surface of last segment of abdomen shining black; legs brownish-black, the knee joints yellowish, trochanters yellow, mid femora with a row of bristles on

¹ This paper is the twelfth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

antero-dorsal surface, the apical three or four much the strongest, antero-ventral row consisting of about seven equally strong, equidistant on the basal half and about fifteen on apical half, the first two of which are strong and widely placed and the next thirteen of which rapidly decrease in size and become closer placed till they form a comb of short setulæ on the thin apical third of femora, postero-ventral surface with a similar row, postero-dorsal surface with a row of bristles which increase in size towards the apex, mid tibiæ gradually thickened on apical two-thirds, pubescence sparse and short, especially on basal half of ventral surface, one antero-dorsal bristle at apical fourth and one at apical third and postero-dorsal surface, as well as one at very close to apex on nearly the dorsal surface and the end spurs, hind femora with a row of bristles on apical half of the antero- and postero-dorsal surfaces which increase rapidly in size on apical third, the last three being very strong, as well as three or four strong bristles on the antero-dorsal surface from apical third to tip, hind tibiæ with a very long bristle at near middle and another at near tip on dorsal surface, a series of four, the middle two of which are strongest, on antero-dorsal surface and a series of four shorter bristles on the antero- and postero-ventral surfaces; wings grayish, inner cross-vein almost directly below the end of first vein, third and fourth veins distinctly convergent at wing margin, large cross-vein slightly bent, barely its own length from inner cross-vein and less than one-fourth the distance from inner cross-vein to wing margin; under scale of calyptra distinctly longer than upper; halteres yellow.

Female.—In color and size similar to the male. Frontal stripe nearly one-third as wide as head, central stripe "matt"-black, bifid posteriorly, eye-margins silvery gray, frontal stripe slightly narrowed towards vertex, antennæ colored as in male, but the arista hardly longer than antennæ; abdomen not so pale as in male and the dorsal stripe interrupted on posterior margins of segments; legs colored as in male but the hind tibiæ are paler, the mid tibiæ have two ventral bristles at apical third, the dorsal bristling being as in male, the hind femora have two very distinct bristles at near tip on antero-ventral surface, a row of short bristles and two or three long ones on antero-dorsal surface, the latter at near tip, and the hind tibiæ have the two dorsal bristles as in male, as well as three or four on the antero-dorsal and antero-ventral surfaces from basal third to apical fourth; the outer cross-vein in wing is nearer to wing margin than in male. Length 2-3 mm.

Allied to *femoralis*, Stn., and *trimaculata*, Stn., from which it may be separated by the striped thorax, the color of the abdomen and the bristling of the hind tibiae.

Localities.—Porto Bello, Alhajuelo and Araján, Panama, Feb.-Apr., 1911 (August Busck). Seven males and three females.

Type.—Cat. No. 14911, U. S. Nat. Mus.

FANNIA GRANDIS, new species

Male.—Very robust; head large, eyes distinctly separated, center stripe velvet-black, eye-margins silvered, frontal bristles strong, face silvered except on the lateral ridge and lower suture dividing it from eye-margins, where it is brown, eye-margins silvered, cheeks and occiput yellow-dusted, antennae yellow, third joint slightly browned at tip, more than twice as long as second, arista yellow, browned on apical half, thickened at base, nearly bare, palpi yellow; mesonotum yellowish gray-dusted with three broad brown stripes, the central stripe is very broad, more or less distinctly divided by two very narrow pale stripes into three stripes on the anterior half, denticulate at suture, gradually broadening to beyond middle and then abruptly reduced to one-third its previous width, lateral stripes not reaching to scutellum, pleurae yellow-gray dusted, scutellum brown on basal half, apical half yellow-gray dusted; abdomen translucent yellow, with a distinct black-brown longitudinal dorsal stripe and a spot on each side on posterior margin of same color which is generally coalescent with the central stripe on basal segments and generally detached from it on apical two, apical segment distinctly, the others indistinctly gray-dusted, second segment with a numerous clump of hairs on basal third laterally, the last two segments with strong apical bristles, hypopygium of normal shape, the ventral surface unusually hairy; legs black, trochanters and knee joints yellow, tibiae piceous, paler basally, anterior femora with each of the posterior surfaces armed on the apical half with long bristles, those on the ventral surface (10-11) very long and strong, those on the dorsal surface beginning before the middle and ending at one-fourth from apex, fore tibiae with a preapical dorsal bristle, fore tarsi distinctly thickened, mid femora distinctly constricted near tip, antero-dorsal surface rather weakly bristled, antero-ventral surface with seven bristles, which are not very long and rather irregularly placed on basal half, the last two widely separated, then an equally long space followed by one strong isolated bristle and a rapidly decreasing, thickly placed series of over twenty which form a comb-

like arrangement on the constricted portion of femur, postero-ventral surface with seven bristles on basal half, the first of which is very long and the remainder rapidly decreasing in size, on the apical half the bristles are small at commencement of series then rapidly increase and form a thick closely placed series of rather curled bristles opposite to the short antero-ventral row, a group of strong bristles is situated at near to tip on posterior surface, mid tibiæ with the ventral surface much thickened on apical two-thirds, ventral pubescence extremely short and close on basal third and basal half of swollen part, long and shaggy on apical third, one antero-dorsal bristle at apical third and one on dorsal surface at near tip besides the apical spurs, hind femora with a large rounded tubercle at beyond middle on ventral surface, a row of bristles on anterior surface which increase in length towards tip and finish on nearly the dorsal surface, anterior surface of the ventral tubercle with numerous long bristles of unequal lengths, ventral surface of tubercle with a fasciculus of long strong bristles which curves in a posterior direction and is somewhat curled at tip, posterior surface with long, soft hairs from base to tubercle, hind tibiæ bent, the usual two dorsal bristles present, three serial bristles on antero-dorsal surface at from slightly before to beyond middle, the last of which is strongest, and an almost ventral row of seven long bristles from about basal third to beyond apical third, the first and last of which are more widely placed than the others; wings brownish, small cross-vein distinctly before end of first vein, large cross-vein less than its own length from small cross-vein, nearly straight, and slightly more than twice its own length from end of fourth vein, third and fourth veins convergent; under scale of calyptra distinctly larger than upper; halteres yellow. Length 5 mm.

Easily distinguished from any species in the group by the tuberculate hind femora. Most closely allied to *fasciculata* Lw. but very different in leg characters.

Locality.—Porto Bello, Panama, Feb.-Mar., 1911 (August Busck). Four males.

Type.—Cat. No. 14912, U. S. Nat. Mus.

LIMOSINA FULVA, new species

Male.—Frons yellow, darker towards vertex, opaque, bristles strong, lateral lower pairs projecting over eye, the center rows consist generally of one strong crossed lower pair, a weaker center pair and a pair of very weak, short hairs almost in line with the lower ocel-

lus, frons nearly twice as broad as long, anteriorly not more produced than at lateral angles, face and cheeks yellow, opaque, the former raised in center, concave in profile, cheeks three times as high at occiput as at anterior edge, anterior bristle long and strong, with one moderately long and a regular series of shorter hairs posterior to it, antennæ yellow, bristles on basal joint strong, black, third joint barely twice as large as basal, covered with very short whitish pilosity, arista brownish, nearly twice as long as breadth of frons, distinctly and thickly pubescent; mesonotum yellowish brown, shining, the humeri always paler, three distinct pairs of dorso-central macrochætæ, divergent and reduced in size anteriorly, pleuræ yellow, with darker, brown, marks and one very long bristle above mid coxæ, scutellum with the disc opaque black, margins brownish and slightly shining, six or eight marginal bristles—the anterior pair sometimes very much reduced or absent—the posterior pair strong, the next pair much weaker and the third (sub-basal) pair as strong as posterior pair, disc of scutellum bare; abdomen brown, basal segment elongate, as long as next two together, remaining segments decreasing in length, all segments with lateral and posterior two with hind-marginal bristles, hypopygium yellow, not very large, and with the ventral surface very hairy; legs yellow, fore femora thickened, with two to three bristles on apical half of dorsal surface and two on apical third of ventral surface anteriorly as well as the numerous short hairs present on all legs, mid coxæ with a dark spot anteriorly, mid trochanters with one long bristle anteriorly, mid femora with a preapical antero-dorsal bristle, mid tibiæ with a short dorsal bristle at near base on dorsal surface and three pairs of bristles—one of each pair on postero- and antero-dorsal surfaces—the first and weakest at about one-fifth from base, the second at about two-fifths from base and the last at about one-third from apex, on the ventral surface there is one bristle at near middle and one much stronger at near apex, as well as about five apical bristles, basal joint of mid tarsi with a noticeably long ventral bristle at near middle and all joints with end spurs, hairs on hind tibiæ very distinct, especially on dorsal surface, one bristle on same surface at near to apex, basal hind tarsal joint not very much swollen and about two-thirds as long as second joint; wings short and blunt, pale brownish, with brown veins, from humeral vein to end of first vein half as long as from end of first vein to end of second, last costal division about two-thirds as long as penultimate section, inner cross-vein at near to middle of longest costal division, basal part of third vein short of half the

length of last section of second vein, fourth vein from inner to outer cross-vein as long as basal portion of third, outer cross-vein distinctly but not greatly longer than inner, third vein distinctly and regularly upward bent on last section, finishing much in front of wing tip, costa not carried beyond end of third vein, fourth vein traceable to margin of wing, almost straight, fifth vein not distinct beyond outer cross-vein, one very long bristle at near base of costa and a double series of shorter, but widely placed bristles from beyond it to end of first vein; halteres pale yellow. Length 1.25 to 2 mm.

Locality.—Tabernilla, Canal Zone, Panama, Jan.-Feb., 1911 (August Busck). Eleven males.

Type.—Cat. No. 14942, U. S. Nat. Mus.

Closely allied to the species mentioned hereafter that was described by Williston as *scutellaris*, but the legs in that species are not entirely yellow, and the venation is different from *fulva*.

LIMOSINA FUSCINERVIS, new species

Female.—Black, subshining; frons black, about one and one-half times as broad as long, raised towards center and anterior outline centrally produced, bristles strong, lower lateral bristle projecting over eye, second projecting backward and outward, third incurved, ocellar bristles divergent, central rows of five each, the lower and upper bristles much the weakest, face gray-dusted, much produced in center, upper mouth edge not much produced, the face in profile slightly concave, cheeks brown, the anterior bristle strong, two moderately long bristles posterior to it, the second rather high on cheek, the usual shorter posterior bristles long and hair-like, antennæ brownish yellow, internal apical and dorsal bristles on second joint strong, third joint not much larger than basal, thickly covered with whitish pubescence, arista brown, about one and one-half times as long as breadth of frons, distinctly pubescent; mesonotum subshining, the short hairs very distinct and all bristles strong, post-humeral bristles incurved backwardly, three pairs of dorso-central macrochætæ, the anterior pair much wider placed than posterior but not weaker, between the anterior pair there is in the type a central bristle, pleuræ brownish, sutures paler, pleural bristle strong, a smaller one anterior to it, scutellum with two posterior and two sub-basal long marginal bristles, and two basal and two sub-apical weaker bristles; abdomen opaque black, bristles weak; legs yellow, mid legs with bristles as in *M-nigrum*, hind femora with three to

four short bristles on apical third of ventral surface, dorsal surface of hind tibiae with long hairs and one long bristle at about apical third on same surface, hind tarsi with basal joint dilated, half as long as second, basal and second joint with yellow ventral brush-like hairs; wings brownish, all thick veins distinctly infuscated along margins, the large cross-vein most distinctly so, from humeral cross-vein to end of first vein not one-half as long as from end of first vein to end of second, last division of costa three-fourths as long as penultimate, basal portion of third vein about one-half as long as last portion of second, and distinctly, but not greatly, longer than fourth vein between cross-veins, last portion of third vein very slightly curved upward parallel with fourth and ending near to wing tip, costa not extending beyond end of third vein, outer cross-vein twice as long as inner, fifth vein very distinct before cross-vein and carried half as far as the length of cross-vein beyond it, fourth vein thick at extreme base beyond cross-vein and last portion and rather distinct to wing margin, costal bristles long to end of first vein; halteres brown. Length 1.5 mm.

Locality.—Tabernilla, Canal Zone, Panama, Feb. 6, 1911 (August Busck). One female.

Type.—Cat. No. 14943, U. S. Nat. Mus.

LIMOSINA M-NIGRUM, new species

Male.—Shining black; frons subshining on stripes where the bristles are situated, the usual two divergent opaque stripes divided by the subshining stripe where the central frontal bristles are inserted leaving an M-shaped velvet black frontal mark, lateral bristles strong, the lower pair directed outwardly over eye, central rows of three each inwardly directed, the lower bristles slightly the longest, basal antennal joint black with the usual bristles strong, third joint brown, half as large again as basal joint, covered with short, thick pubescence, arista dark brown, about one and one-half times as long as breadth of frons, distinctly but sparsely pubescent, face brown, distinctly produced in center, slightly concave in profile just above mouth margin which is produced, cheeks opaque, pale brownish, the anterior and second marginal bristles strong, the posterior bristles much smaller, cheek at occiput more than twice as high as at face margin; mesonotum slightly gray-dusted, dorsal hairs long and numerous, three pairs of dorso-central macrochaetae, the anterior pair very widely placed, post-humeral bristles strongly incurved, scutellum with two strong posterior marginal, two weaker median,

almost discal, and two long and strong sub-basal marginal bristles and usually two weak basal hairs on the margin, pleuræ opaque black, yellowish on sutures and posteriorly low down, pleural bristle strong; abdomen with basal segment as long as next two, all segments with lateral bristles and the apical two with posterior marginal bristles, hypopygium yellowish, not very large, with central posterior depression and numerous hairs; legs brown, knee joints, bases of femora and tarsi yellowish, mid trochanters with a long bristle on anterior surface, mid femora with preapical posterior bristle and a series of about five regular short bristles, the apical one slightly longer, on the anterior surface at from about middle to apex, mid tibiae with two ventral bristles, and dorsal bristles situated as in *fulva*, hind femora with two short preapical antero-ventral bristles, hind tarsi with the basal joint not much dilated and slightly more than half as long as second; wings brownish, veins brown, from humeral vein to end of first vein half as long as next costal division, the last costal division two-thirds as long as second, basal portion of third vein barely two-fifths as long as last portion of second and equal to fourth vein between cross-veins, outer cross-vein twice as long as inner, third vein regularly bent upward and finishing at distinctly, but not greatly, in front of wing tip, costa not extending beyond end of third vein, the base of costa long fringed to end of first vein, fourth vein indistinct, but traceable to margin beyond outer cross-vein, fifth vein not traceable beyond outer cross-vein; halteres yellow. Length 1 mm.

Locality.—Three specimens, one from Paraiso and two from Tabernilla, Canal Zone, Panama, Jan.-Feb., 1911 (August Busck).

Type.—Cat. No. 14944, U. S. Nat. Mus.

PREOCCUPIED NAMES IN LIMOSINA

L. scutellaris, Williston, Trans. Ent. Soc. Lond., p. 432 (1896) non Haliday, Entom. Mag., III, 329, 8 (1836).

I propose for this species *discalis*, nov. nom.

L. lugubris, Williston, Trans. Ent. Soc. Lond., p. 433 (1896) non Haliday, Entom. Mag., III, 332, 18 (1836).

I propose for this species *sublugubrina*, nov. nom.

Both species from St. Vincent, W. I.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS

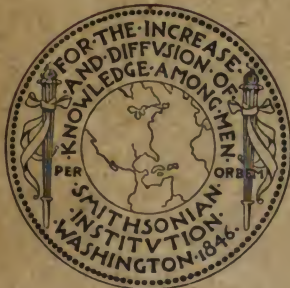
VOLUME 59, NUMBER 18

NEW SPECIES OF LANDSHELLS FROM
THE PANAMA CANAL ZONE

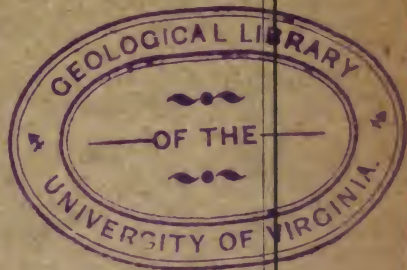
WITH TWO PLATES

BY

WILLIAM H. DALL



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NEW SPECIES OF LANDSHELLS FROM THE PANAMA CANAL ZONE¹

(WITH TWO PLATES)

By WILLIAM H. DALL

Mr. E. A. Goldman, of the U. S. Department of Agriculture, in the course of exploration in connection with the Smithsonian Biological Survey of the Panama Canal Zone and adjacent region, investigated in May, 1912, the Pirri range of mountains to the eastward of the Canal Zone. This range attains a height, in some places, of five thousand feet above the sea and apparently had not been visited by any collector previously. Although it was the dry season he obtained a half dozen landshells of three species, two of which appear to represent new forms.

The well-known *Pleurodonte labyrinthus* Desh., has been obtained by Mr. Pittier from Santa Isabel, Panama, and is represented by fairly large series from various localities in the National Collection. The characters, having regard to difference of age, are very constant and uniform throughout the series. In fact as in the case of *P. tenaculum*, now represented by several specimens, the material from the Canal Zone shows no more variation within the species than would be noted by a careful observer in a similar series of a species from the temperate zone. It is probable that as in many other cases in better known regions, what appear in a miscellaneous lot of specimens without exact locality data to be mere individual variations, would prove, were our knowledge more complete, to be tolerably constant racial or specific characters.

A single specimen was obtained by Mr. Goldman which differs so much from the typical *P. labyrinthus* that I am compelled to regard it as distinct.

PLEURODONTE (LABYRINTHUS) GOLDMANI, new species

(PLATE 2, FIGURES 1, 2)

Shell lenticular, purplish-brown, with a sharply carinate periphery and finely granulate surface, about six and a quarter whorls; the nuclear $2\frac{1}{2}$ whorls are sculptured with fine, slightly vermicular, close-set radial lines in harmony with the lines of growth; this sculpture ceases abruptly and is replaced by the ordinary incre-

¹ This paper is the thirteenth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

mental lines; the aperture is very similar to that of *P. labyrinthus* and is best described differentially; in both the thickened peristome partly overshadows the deep umbilicus, but in *P. goldmani* the commissure is prolonged and turned upward into the umbilicus, nearly reaching the suture of the last whorl; the upper part of the peristome is in line with the parietal lamina and nearly parallel with the opposite part of the peristome, while in *P. labyrinthus* the parietal lamina meets the peristome at a right angle and the area included by the lamina and peristome is nearly triangular; in *labyrinthus* there is a deep cavity on the other side of the parietal lamina caused by the whorl descending as it ends before forming the peristome, while in *goldmani* the whorl does not descend and the area referred to is flattish; in *labyrinthus* the short upper lamina is directly opposite the space between the parietal and outer basal laminæ, in *goldmani* the short lamina is opposite the end of the outer basal lamina; finally the sulcus at the end of the carina in *labyrinthus* is shallow, wide, and hardly rises above the carina, while in *P. goldmani* the sulcus is very narrow, recurved, and rises above the carina in a rather large funnel-shaped opening with a thin flaring upwardly directed margin; this opens into the lumen of the whorl behind the armature of the aperture and may serve the same purpose as the opening behind the aperture in *Opisthosiphon*.

Maximum breadth of shell 39.0; minimum do. 31.5; height 15.5 mm. Similar measurements of an average *P. labyrinthus* are 50.0, 42.0, and 20.0 mm. (See plate 2, figs. 3, 4.)

PLEKOCHAILUS PIRRIENSIS, new species

(PLATE I, FIGURES 1, 2)

Shell large, thin, whitish, minutely densely granulose, covered with a rather dark yellow-brown periostracum, painted with narrow oblique zigzag streaks of dark purple-brown, varying in density in different individuals. Nucleus (lost in the specimens); whorls about four and a half; axis barely perforate, the chink overshadowed by the pillar-lip; peristome white or slightly yellowish, with a thick band of callus uniting the pillar and the outer lip over the body; throat whitish, the painted pattern showing through, the peristome conspicuously reflected. Dimensions of four specimens:

	A.	B.	C.	D.
Height of shell.....	82	83	85	79
Height of aperture.....	58	55	55	51
Maximum diameter of shell.....	67	55	54	57
Maximum diameter of aperture.....	42	38	41	38

This is obviously of the group of *P. coloratus* Nyst, but differs in form and in its white peristome. The umbilicus varies in amplitude in different individuals.

With the above was an immature specimen of *Oxystyla* with a conspicuously minutely reticulate surface, fine spiral threads crossing minute regular axial ridges with equal interspaces, the color purplish, with three narrow pale equidistant spiral bands.



1



2

PLEKOCHILUS PIRRIENSIS New Species



1



2



3



4

1, 2.—PLEURODONTE (LABYRINTHUS) GOLDMANI, New Species
3, 4.—PLEURODONTE LABYRINTHUS Desh.

SI
2153-9¹⁹
SMITHSONIAN MISCELLANEOUS COLLECTIONS

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EARLY NORSE VISITS TO NORTH AMERICA

WITH TEN PLATES

BY
WILLIAM H. BABCOCK



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EARLY NORSE VISITS TO NORTH AMERICA.

By WILLIAM H. BABCOCK

(WITH TEN PLATES)

In the rather long continued labor of preparing this monograph, the author has had occasion to recognize gratefully the kindly willingness of scientific men and of scholars generally to extend a helping hand. He would especially mention the philological assistance of Mr. Juul Dieserud and his patient oral translation of the writings of Dr. Nansen and others before their appearance in English; the helpful criticism of my manuscript by Prof. Julius E. Olson; the explanation by the late Dr. W J McGee of the observed progressive changes of level along our seaboard by glacial recession and resultant continuing crustal wave action—a theory since corroborated by other authorities—which affords a reasonably trustworthy conception of the American Atlantic coast line and its conditions about the year 1000 A. D., and thus throws new light on the regions and special places intended by the names in the saga; the efficient aid of Mr. James Mooney in Gaelic and Indian problems; and the sympathetic interest of Mr. David Hutcheson who has furnished a copious supply of data on the subject supplemented by some personal field-work near one possible Hóp of the Norsemen.

I.—THE NEW WORLD PRELUDE

Concerning the discovery of America before Columbus, there are many theories, fancies, and claims; but only two visits can be considered historic, namely, those of Leif Ericsson and Thorfinn Karlsefni. The Wineland or Vinland of these explorers has been so greatly misunderstood and has been made the basis of so much elaborate and contradictory explanation during the past three centuries that only the hope of clearing matters a little by patient research would perhaps justify one in adding to its volume. The importance

and permanent interest of the topic really demand the careful application of every available test.

Obviously we must aim to distinguish the true narrative from less reliable accretions and competitors. We must also ascertain as nearly as possible the condition of the American shoreline at the period to which the statements of the sagas apply. These are the prime requirements, and yet whatever else may throw any light on the matter should not be neglected.

A preliminary glance is perhaps needful at what preceded the appearance of the Norsemen in the New World. In a fundamental sense the title "New World" is deserved, for science and the most venerated writings agree in ascribing priority of human life to the other hemisphere, though their reasons differ widely. Most anthropologists believe that man first walked over to America;—from Europe as Dr. Brinton¹ supposed, from Asia as many others have claimed—but in either case the route was at one, if not both, of the far northern corners of the continent. The crossing is indeed occasionally made in winter at the present day on the ice at Bering Straits, as reported to Dr. Dall,² and in summer by boat almost at will. However, no traces have yet been discovered of such passage from Iceland or any other possible stepping stone on the eastern side.³ But even the earliest coming, however remote, must have been rather late in the history of our race, an unarmored, ill-equipped offspring of the tropics, which had a long way to travel by slow degrees. The immigration may have been in a small way and often repeated. Whoever came first to America, however, or whence they came, or when, we have in the present inquiry to deal only with the Eskimo and their southern neighbors. When Europeans finally lifted the Atlantic curtain, the Eskimo were found as far south as the upper end of Newfoundland; they clung to the sea-shore almost everywhere.

Below these Innuits along the coast, and behind their southeastern wing in Labrador, as well as nearly everywhere throughout the temperate parts of the continent, there were other uncivilized men

¹ D. G. Brinton: *The American Race*, (1901), p. 32.

² W. H. Dall: *The Origin of the Innuits*; in *The Tribes of the Extreme Northwest*, p. 97.

³ C. R. Markham: *Origin and Migrations of the Greenland Eskimo*; in *Arctic Papers for Expedition of 1875*, p. 166. See also W. H. Holmes: *Some Problems of the American Race*. *Amer. Anthropol.*, vol. 12, no. 2 (1910), p. 178. Cf. A. Geike: *Fragments of Earth Lore*, p. 263.

in various stages of development, whom we habitually call Indians by misnomer, although "Amerind"¹ has won a place in scientific writing. These, or the dominant racial elements of them, appear to have come into North America from the regions near and behind these natural crossing-places above Japan, where tribes are yet found,² chiefly in mountainous insulated or nearly insulated homes of refuge, so like our wild native people that we should call them Indian without question if bodily shifted here. Whether this eastward human wave preceded, followed, or accompanied the Eskimo; what their reciprocal action and relations may have been until the first known distribution of races and territory was established; and whether the tribes of Saghalien and Kamchatka above referred to were left behind or have forced their way through the Eskimo and across the sea to their present seats,³ are matters debatable which need not concern us here. These Indians could not have been on the ground for a very great number of centuries or the population would have been denser, the linguistic stocks more plentiful. In the immense area between the Arctic Ocean, the Rocky Mountains, the Gulf of Mexico, and the Atlantic there were barely a half dozen principal linguistic families⁴—the Athapascan, Shoshonean, Algonquian, Siouan, Iroquoian, and Muskogean. These people, however, had undergone varied experiences;⁵ therefore they differed widely here and there: yet they were enough alike to give us the accepted ideal Indian of our coinage. These few vigorous groups have made nearly all of North American history on the Indian side.

The long list of languages in North America, so often insisted on, include some that appear to be but of minor flecks and patches on the western border of our linguistic map, resembling nothing so much as the debris of waves that had struck without force to pass on, and of human fragments in the mountain nooks above the Isthmus. They all have their own abundant interest, but it does not concern our

¹ Other substitutes will hardly do. Red Indian, for example, has meant Beothuk specifically. Even American Indian means Passamaquoddy, but not Micmac, on Grand Manan.

² C. H. Hawes: In the Uttermost East, p. 35. Cf. Geo. Kennan: Tent Life in Siberia, p. 171. Also his Siberia and the Exile System vol. 2, p. 400; and Mythology of the Koryak (Jochelson). Amer. Anthropol. (1904), vol. 6, p. 413.

³ A. F. Chamberlain: Origin of American Aborigines.—Linguistics. Amer. Anthropol. (1912), vol. 14, p. 55.

⁴ See map in Bulletin 30, pt. 1, Bureau of American Ethnology.

⁵ See Notes to Chapter 16.

present inquiry; nor does the much debated problem of the semi-civilizations, extending in a long line from central Mexico to Chile down the uplands of that front of our double continent which looks ever toward the primal Asian centers of human culture.

Excepting at or near its narrowest part, the two sea-shores of North America were as two different worlds. There was never anything even semi-civilized along either of these shores in the Wineland latitudes; nothing much above stark savagery near that portion of the Atlantic shore, even with a liberal inclusion of territory to the southward. Population was indeed almost unbelievably scanty. No other part of that region was quite so bountifully supplied by Nature as Powhatan's domain near the Chesapeake, yet Strachey's¹ miniature census, river by river and town by town, has a really ridiculous, though pathetic, look. The best recent estimate² gives not more than seventeen thousand Indian inhabitants to all Virginia at that time, with 8,500 for the Powhatan Confederacy; and there may be a thousand of mixed blood there now—Chickahominys, Nansemonds, Pamunkeys, Mattaponies and other remnants—hardly noticed at all. The City of Washington, with its present population of 350,000, was prefigured by an important Indian town, which in an emergency could muster eighty fighting men for the defense of the finest shad and herring fisheries to be found anywhere.

The League of the Five Nations (central New York) could hardly put two thousand men into the field; yet this active little force imposed terror on most of the settlements between Hudson Bay and Georgia and between New England and the Mississippi. Along Narragansett Bay and slightly beyond, the density of population may have been somewhat greater; but King Philip in his most formidable estate could never assemble any imposing array. A few Englishmen sufficed to storm and ruin the fortified chief towns of the Pequots and Narragansets, the most powerful tribes about them. The upper New England coast was far more scantily peopled, as clearly appears from the slightly earlier notes of Champlain.

We have no trustworthy ground for assuming a substantially different state of affairs for the year 1000 A. D. along the Atlantic coast, although at that time there seems to have been a relatively large and

¹ W. Strachey: *The Historie of Travaile into Virginia*, pp. 40 *et seq.*

² J. Mooney: *The Powhatan Confederacy*. *Amer. Anthropol.* (1907), pp. 130, 132.

advanced Indian population¹ in the Ohio valley and beyond. These "mound-builders," of debated tribal and linguistic affiliations, appear to have worked up the great rivers from the south and remained a long time in distinct and differing nations or communities, at last withdrawing or being scattered rather mysteriously. It is well known that they left great earthworks behind them and other notable vestiges; but they may not have been known on the seaboard more definitely than they are to-day.

The Athapascan, Shoshonean, Muskhogean, and other remote stocks are clearly beyond our field of vision. Mr. Lloyd² would put the Iroquois also at the time we are considering too far away in the northwest: but according to Dr. McGee's Chesapeake tidewater theory they were much nearer.³ Still, no one places them on or near the seaboard in northern latitudes. The Sioux may have been in force along the eastern watershed of the Appalachian mountains, where we find them later, apparently losing ground: but they probably never crossed the Delaware. This narrows the field to the Eskimo, the Beothuk, the Algonquian tribes, and possible unknown predecessors, for the stretch of coast between Baffin-Land and the Chesapeake.

Below the Gulf of St. Lawrence we find this shore occupied in the early seventeenth century, and apparently in the fifteenth and sixteenth, by different tribes of the Algonquian family, the Micmac or Souriquois extending farthest to the northeast as they do now. On the island of Newfoundland⁴ were the quite distinct and puzzling Beothuk, doubtfully struggling to hold their ground against the encroachments of the Eskimo on the north and of the Micmac on the southwest.

There are some indications that these islanders had previously occupied parts of Maine and Nova Scotia. They appear with the air of people in misfortune, clinging to their last refuge and sharing some characteristics of their oppressors on both sides. A fuller understanding of their earlier history might be helpful in the solution of divers northeastern problems in ethnology. But there seems to be nothing to indicate that they ever established themselves far below the

¹ N. S. Shaler: *Nature and Man in America*, p. 81.

² Lloyd's notes in L. H. Morgan's "The League of the Iroquois," p. 188.

³ W J McGee: *The Siouan Indians*, 15th Ann. Rep. Bur. Amer. Ethnol. p. 189.

⁴ D. G. Brinton: *The American Race* (1901), p. 67. Cf. Capt. Cartwright and his *Journal*. Repub. 1911. First 20 pages. (Ed. by C. W. Townsend). Also Whitbourne. Cormack and others hereinafter cited.

Bay of Fundy, and there is nothing whatever that looks like an Eskimo extension southward, except a tool or so and one or two very doubtful river names, reported by Thalbitzer,¹ all on the northern border of New Brunswick, which, if really Innuït in origin, would be sufficiently accounted for by occasional southward explorations or harryings. That any Eskimo ever left the St. Lawrence basin to dwell in a more southerly region is an assumption based on no evidence whatever. Their long established habits would oppose any considerable return toward warmth and away from snow-banks, whales, and seals.

For predecessors of the Algonquian tribes we have equally no data ; nor do we know when the latter first arrived on the Atlantic shore. Most investigators agree in placing their origin north of the St. Lawrence River. They seem to be an ancient people. Very likely they worked down from that valley by way of the lesser rivers—the Hudson, Connecticut, Housatonic, Kennebec, Penobscot, and St. John. There seems to be nothing to make such a migration before 1000 A. D. at all improbable, though it might be incomplete.

The year 1000, however, for America, seems very far back in antiquity. Perhaps we hardly realize how much of what we consider ancient was then yet in the future. The Mayas² no doubt were established in some cities of the Usumacinta Valley and Honduras, though hardly anywhere in Yucatan ; the Inca conquests may have begun, but can hardly have been pressed very far ; the Aztecs perhaps had not yet even heard of the Valley of Mexico. Since there is so much to be learned about the origin of these higher cultures, it is small wonder that we are in the dark or twilight as to ruder tribes, which have left neither records nor monuments. It is not probable that we have even a pictograph on the Atlantic coast which has endured for nine hundred years, and if one could be found it would perhaps represent no more than some passing caprice of the Indian mind.

From this point of view we can only say that Algonquian tribes were in possession as far back as we know and that the burden of proof must be on those who suggest any others—*a fortiori*, the milder burden of presenting at least some modicum of evidence tending to show either predecessors or temporary displacement and supplanting.

¹ The Eskimo Language, p. 20.

² Morley: The Correlation of Maya and Christian Chronology. Amer. Journ. Archeol. (1910), p. 193.

2.—THE OLD WORLD PRELUDE

Humboldt¹ implied, and Fiske² and others have since explicitly suggested, that there may have been many pre-Columbian voyages to America of which no record has been discovered. On the Pacific coast indications of such voyages survive in the presence of the cocoa palm, which is found in America as well as in Asia and on islands all the way across, and which antedates the period of the earliest recorded visitors to the New World, though never planted by unassisted nature, so far as we know ;³ in local legends of the landing of sea-tribes on the South American coast ;⁴ in the evident Mongolian features of certain minor northwestern littoral tribes,⁵ and some peculiarities of the language of others, apparently Polynesian ;⁶ in the architecture and sculpture of ancient Mayan cities, for example, the Chinese or Cambodian-like figures of Copan,⁷ and in the extraordinary similarity of the whole series of the signs of the Zodiac in Greece and Babylon, Mexico and Peru.⁸

The eastern gates also have their indirect evidences of approach in a variety of forms which are mutually confirmatory and of undeniable cumulative importance, though not yet amounting to full proof. Thus, in Humboldt's *Examen Critique*,⁹ we find a few instances, at widely separated periods, of strange men and boats arriving, apparently from the west, on the outlying European islands. He never visited these places, and close investigation of these tales at so late a time was impossible ; but he seems to have given them some credit. No doubt they lend a slight degree of support to the sailor story in the Zeno narrative, the Phenician legend of Diodorus quoted in Dr.

¹ *Examen Critique*, vol. 5 ; in considering the Voyage of Madoc.

² *The Discovery of America*, vol. 1, pp. 181-185.

³ O. F. Cook in *Amer. Anthropol.*, 1909, p. 486.

⁴ Justin Winsor: *Narr. and Crit. Hist. of America*, vol. 1, p. 82, note.

⁵ H. H. Bancroft: *Races of the Pacific States*, vol. 1, p. 225. Cf. W. H. Dall: *Tribes of the Extreme Northwest*, p. 237.

⁶ C. Hill-Tout: *Oceanic Origin of, etc.* *Trans. Royal Soc. Can.*, Sec. 2, vol. 4 (1898).

⁷ Thomas and McGee: *Pre-historic North America*, p. 256 (vol. 19 *Lee's Hist. of America*). Also Stephens: *Central America*, Chiapas and Yucatan, (see Catherwood's views), and *The American Egypt*, by Arnold and Frost, pp. 213 and 269.

⁸ S. Hagar: *Origin American Aborigines*. *Astronomy*, read Dec. 27, 1911, in symposium of *Amer. Ass'n Adv. Sci.*, *Amer. Anthropol.*

⁹ Vol. 2, p. 259. Cf. James Wallace: *A Description of the Isles of Orkney*, pp. 33, 34.

Nansen's *In Northern Mists*, the Norse-Irish accounts of the finding of Ari Marsson in his western home, and other reports of unlucky men who from time to time were storm-driven far across the Atlantic. If mariners or wanderers could thus casually make the passage from west to east, why not from east to west? The still rather common fate of being at the mercy of the elements and of an undesired landfall should not be regarded as suspicious, although of course often utilized in the fiction of all countries and periods. Horsford's¹ chart of the courses of wrecks and derelicts is a curious exhibit of their frequency in later years along a part of our coast. Would that frequency be less when both vessels and skippers were without compasses or charts, and in every way poorly equipped to elude or overcome their dangers? D'Avezac² relates, in passing, two rather early instances recorded of wrecks on the Canaries and the Azores—a French vessel of about the year 1336 and a Greek craft in 1370. For that matter, disabled ships have been known to wander over the Atlantic month after month in recent years, reaching in succession widely separated regions; and, if left to themselves, might have stranded finally almost anywhere.

The map of the Atlantic Ocean itself suggests that very early crossings were much more than possible; exhibiting as it does a strait-like narrowing between South America and Africa, and another at the far north, where the Faroe Islands, Iceland, and Greenland make convenient stepping stones. Moreover, warm, alluring islands are scattered out before Morocco and the Iberian peninsula so widely that the farthest is about halfway between Cadiz and Cape Race. Even from the tip of Brittany, the southwest of Ireland, or the Basque provinces of northwestern Spain, that corner of Newfoundland was not inordinately far. There were also favorable ocean currents at some points, the most notable of which swept then, as now, southward along the outer front of the Azores, Madeira, and the Canaries; then in a wide curve moved westward to the Caribbean, joining there another stream from the lower African coast. The various natural crossing routes above indicated were the main highways of early accidents like those above mentioned, often merely legendary, but historical in the cases of Leif and Cabral.

¹ Landfall of Leif. p. 4.

² Discoveries of the Middle Ages, p. 32. Much more recently a small vessel, leaving one Canary Island for another, was blown off and afterward found with her crew well over toward South America. Also a fishing crew of the Newfoundland banks was similarly driven to the Azores.

Who can say how early these crossings of the ocean may have begun? It is true, as Prof. Shaler¹ has suggested, that there might have been great difficulty in winning home again without a keel; but ancient Egypt, Greece, and Phenicia all used this important appliance, according to Dr. Nansen;² the Celts, Saxons, and Normans continued its use, and Scandinavian shipbuilding, in this as in other things, inherited from antiquity and the Mediterranean. Besides, the Polynesians in their great sea-boats have made recorded ocean voyages more extensive than crossing the Atlantic, and there must have been many such in far earlier times, or islands as remote as Hawaii and Easter would not have been peopled by them. Why must we suppose that there were no navigators on the Atlantic side of America who were able to emulate the dusky adventurers of the Pacific?

We must remember that the Mediterranean civilization had an outpost at Cadiz from about 1100 B. C., directly facing America; that, like all Phenician towns, it was probably even then a center of maritime curiosity and enterprise, and, at any rate, had grown into a wealthy and far-reaching commercial city when visited five hundred years later; and that in the middle of the twelfth century, after a long period of Mahometan rule just ended, it was still important enough to make Edrisi greatly exaggerate on his map the size of its peninsula, making this an island, and giving it a name when most other islands of the sea went nameless.

We know that Phenicia, Egypt, Greece, and Rome were somehow aware, or dreamed, of lands beyond the great water; and that these fascinating suggestions were useful long afterward in helping to inspire Prince Henry and Toscanelli, Columbus, and Cabot. It would be a pleasure to find their enduring charm rooted in real knowledge, as it well may have been; but modern works on Atlantis—for the most part valueless—add nothing trustworthy to Plato's memorable report of legendary echoes; and we must feel that this story, and others like it, may have arisen from some vision, as unreal as the white surviving phantom city which a Central American padre saw from a mountain top so vividly that he made Stephens' believe in it also, with several picturesque romances by Haggard, Westall, and others for a much later result. Yet this is not the only and inevitable expla-

¹ *Nature and Man in America*, p. 189.

² In *Northern Mists*, vol. 1, pp. 37, 40, 48, 242, 248.

³ *Central America, Chiapas and Yucatan*, p. 195. Also J. L. Stephens: *Travels in Yucatan*, pp. 191 and 202.

nation, and there are divers corroborative items, of various degrees of cogency, to be considered, which go to make up a fair probability that some of these early, half historic glimmerings were something more than fancy-play or mere lucky conjectures of the truth.

We should naturally expect the Phenicians of Cadiz and Carthage to reach the Madeiras and the Azores, which lay out before them, and were rather more accessible than Britain. Storms would drive them there if they lacked the hardihood to try the chances of the open sea, and one little island group would lead them on to another. In a cavern of St. Michael's,¹ of the middle Azores, an inscription is said to have been found by early explorers, which has been commonly supposed to be Phenician because identified as Hebrew, a closely allied script and tongue, by a "Moor, the son of a Jew," who was with the party, but could not, or at least did not translate it. The tale is from Thevet, cosmographer of Henry III, who says that he visited these islands long afterward. Remembering divers American "Phenician inscriptions," called so before Norsemen were put forward as our chief inscribers, one desires at least a better expert opinion, and a more generally trusted transmitter than Thevet.

The knowledge of these islands kept on through the centuries in an intermittent, glimmering way. The ancient Irish legends of exploration have much to say of islands to the southward which, in part, must be the Azores, if real, and in particular of islands notable for their fine sheep, their singing birds, or their dangerous monsters. Then the Moors, conquering Africa and the Iberian peninsula, soon came to the front as navigators, and we find again the Isle of Sheep, the Isle of Birds, and the Isle of the Dragon in Edrisi's Atlantic series, distinct from the Canaries which he had described already. Furthermore, his twelfth century map shows a string of islands stretching northward from below Gibraltar parallel to the western shore of Europe, sadly out of place for accurate geography, but in an arrangement fairly paralleled by the fifteenth century map of Zuan da Napoli, who gives us the names of Corvo and the other Azores. The chain of record seems reasonably complete, and early visits, even to that mid-Atlantic island and its companion, Conigi or Flores, must have been rather numerous. Who can believe that such visitors would all pause there with the vision in their souls of other islands equally probable, equally delightful out beyond?

¹ Humboldt: *Examen Critique*, vol. 2, p. 240.

Edrisi¹ records also the celebrated Magrurin expedition from Lisbon, which is generally mentioned as occurring a little before the expulsion of the Moors in 1147, though it must have been earlier, since in 1154 he mentions a street named after them, with no hint of recent naming. They had resolved, it appears, to cross the Atlantic, but turned southward after getting twelve days out, into the weed-encumbered Sargasso Sea, and seem to have wandered rather aimlessly toward the African coast, along which, at last, they made their way home.

Humboldt² supposed that their farthest point may have been one of the Cape Verde group. Other inquirers think it more to the northward. The story gives the prince of that island an Arabic interpreter and makes him declare through this mouthpiece that his royal father had sailed forty days beyond it without finding land; after which he promptly shipped his visitors to Africa. But we do not know Edrisi's authority for what these wanderers related. Giving it full face value, however, there is nothing to indicate that they crossed the ocean.

The same is equally true of the Genoese brothers³ Vivaldi who, according to old chronicles of their city, "undertook" about 1285, in the very spirit of Columbus "a new and untried voyage, that to India by way of the West." This has been taken to import a voyage around the Cape of Good Hope, and possibly may mean nothing more, yet the words are memorable. Besides, the fourteenth century maps, long antedating the Portuguese discoveries, give Italian names almost exclusively to the Azores, which would lie well out of the way of the course supposed. Either these adventurous men or others of their country must have ranged widely eastward and northeastward, with close quartering of the sea. One is tempted to think that they can not have been so very far from the Newfoundland banks or the Bermudas in some of their outward sweeps; for they found and named all the more eastwardly islands that are known, as well as two or more dubious ones with Irish or Arabic names over which men still puzzle and wrangle. For the Irish were ever before the Arabs in their explorations—how far we cannot guess, the voyages of the Celts having begun far back beyond the twilight of history. Perhaps the

¹ Edrisi: *Geography*, Jaubert's transl., vol. 2, p. 27. Their voyage is briefly related also in *Examen Critique*, vol. 2.

² *Examen Critique*, vol. 2, p. 237.

³ M. D'Avezac: *Discoveries of the Middle Ages*, p. 23. Also Humboldt: *Examen Critique*, vol. 2, p. 234.

first that we hear of which can possibly have any significance in this connection is Arthur's mysterious and disastrous foray into some northern Gaelic region, in quest of "The Spoils of Annwn."

The ancient poem in the Book of Taliessin,¹ bearing that title, seems to have a nucleus of reality, though surrounding the British leader, as does the perhaps equally archaic story of Kilhwch and Olwen,² with accessories borrowed from some fading pagan god. At any rate, these verses may have been the germ of the fictitious Arthurian conquest of Ireland and Iceland related by Geoffrey of Monmouth, that most romantic and romancing of literary bishops—who in this instance has found a believer to some extent in even the veteran investigator Rev. B. F. De Costa, for the latter says: "The expedition of Arthur to Iceland may be regarded as historic."³ One may be pardoned for regarding this deliverance itself with some astonishment. As to the origin of these medieval extravagances in that poem, it is pleasant to find one's independent conjecture anticipated and confirmed by a suggestion of Sir John Rhys⁴ published long ago.

There is a most interesting sequence of Irish sea-tales better worthy of our consideration. First, the Voyage of Bran, even as a composition, apparently dates well back into early heathen times. Dr. Zimmer⁵ credits parts of it to the seventh century, but they include a quite irrelevant prophecy, made by a sea-god in person, which utterance, though itself archaic in subject matter, is evidently an addition to an original simple story. This nucleus may well be very ancient indeed.

Bran the son of Febal, we are told, having been summoned by a mysterious and lovely feminine being, sailed over the ocean to the Isle of Joy, where everyone laughed without ceasing. One of Bran's men went ashore, and forthwith took to laughing also. His comrades could get no answer from him, so sailed on and let him be. At the next island a lovely enchantress threw a ball of magic yarn to Bran; which hit the mark and held, so that she drew him and all of them ashore. She kept them with her and her fair companions for a year as it seemed, but really it was many years. At last one of the crew was taken with a great longing for home; so Bran carried him back to Ireland. But when the man stepped ashore, he fell to

¹ W. F. Skene: *The Four Ancient Books of Wales*, vol. 1, p. 264.

² J. Rhys: *Introduction to Malory's King Arthur*, p. 224.

³ B. F. DeCosta: *Arctic Exploration*. *Amer. Geogr. Soc. Bull.* 1880, p. 163.

⁴ J. Rhys: *The Arthurian Legend*, (1890), pp. 10, 11.

⁵ Alfred Nutt: *The Voyage of Bran*.

ashes, as though very long dead. Bran took warning and would not land. He lay off shore and told the people his story; then put out to sea and was never heard of again.

What fact, if any, is behind this delightful old pagan allegory? Of course it may possibly embody a memory of summer isles of Eden really visited; or it may be no more than the play of sea-side fancy among sunset clouds, or an echo of wonder-*tales* older than the *Odyssey*. The legend, as a whole and in detail, has been exhaustively considered in a valuable work by Mr. Nutt,¹ but we can get no nearer than this to the origin of its germ.

The Voyage of Maelduin² inherits from the Voyage of Bran and borrows from many quarters, even one of St. Brandan's shipmates being among its later acquisitions. Every successive editor and enlarger of the story seems to have felt bound to outdo his predecessors. Its wonders are manifold: ants as large as colts; a supernatural cat and its palace; a horse-monster with blue claws; a holy anchorite clad only in his white miraculous hair; a wicked monastery cook marooned in a little private hell on a barren rock for having played the thief and served uneatable food to his brethren. All told, this Voyage of Maelduin is hardly convincing, except as to the possibilities of Irish fancy unrestrained; which compares ill with the dramatic grip, epic power, and graphic quality of Icelandic narration. However, it passes along the tradition of lovely tropical islands in distant seas.

St. Brandan the Navigator was real, the abbot of a Kerry monastery near the end of the sixth century. His experiences are sung in twelfth century Latin verse and told in early Gaelic prose, as well as in the fine English translation printed by Wynken de Worde, successor to Caxton—not contemporary testimony, to be sure, but probably reliable as to the main fact and general course of his Atlantic journeying, with more or less of the details.

Humboldt thought St. Brandan may have gone northward, visiting the Orkneys; but he seems to be wrong, for the narrative has a southern cast. A writer in the *Celtic Review*,³ Mr. Dominick Daly, at first argued for the Bahamas—making the saint forestall Columbus—with an ingenious marshaling of winds and current, and other data not all quite so tenable. But he seems to have been converted to Teneriffe and her island sisterhood by Markham's translation of

¹ Alfred Nutt: *The Voyage of Bran*.

² Joyce: *The Voyage of Maelduin*.

³ *The Celtic Review*, vol. 1, p. 139.

Espinosa.¹ He must be right in the change. Yet Mr. De Roo's² very bulky volume takes St. Brandan across in a higher latitude; and Mr. Cantwell³ plants him near Cairo, Illinois, with Ernulphus and Madoc to follow.

Saint Brandan (or Brenden or Borondon) was summoned, like Bran; but only by an abbot, poor fellow, and for a search in south-western waters after one Mernoc, also very holy and quite vanished. Another object of his quest was the real original garden of Adam and Eve, a rather difficult order. According to some accounts the Breton St. Malo went with him, the lost Mernoc being a Breton too. Afterward St. Malo had a voyage of his own, at least in literature, along similar lines.

The ship of Brandan, like that of Maelduin, was hide-covered over a wooden framework, the hide being in three layers, one inside, two outside; and there were other coincidences as to the embarkation and the number of sailor-monks. Furthermore, two of the crew were foredoomed in each case. But propriety was now strictly observed. No magic yarn-balls caught the saint; he was not fished for by any kind of Circe or Calypso. The reasons are not given. Only once a faint semblance of peril may seem to threaten, in his visit to an island monastery of some easy order, where angels lighted the tapers and served meals for the brethren, exciting only a reverent astonishment in the pious guest. Very humanely and winningly, though, he warns off the tormenting swarms of devils from hapless Judas, bidding them let the poor creature have that one night in peace. And about the loveliest fantasy in literature is that of the divinely singing birds, who were really unlucky angels, doomed only to serve God in this delightful way, "because our sins had been but little. Then all the birds began to sing evensong, so that it was an heavenly noise to hear."

The legend was a liberal dealer in matters of myth, borrowing and lending. Under one of these heads and as proof of Irish-Arab interchanges already alluded to, either direct or through others, we must rank the island-monster, which punished the building of a fire on it in mistake, and the roc-like bird that began life again after the manner of the phoenix. Only, this was by immersion in a Pool of Youth, which passed on to later times, prompting, it may be (with

¹ The Celtic Review, 1909, p. 273.

² P. De Roo: History of America before Columbus.

³ E. Cantwell: Pre-Columbian Discoveries of America. Mag. West. History, vol. 13, p. 141.

native aid), Ponce de Leon's pathetic effort to turn a dream into reality.

Among vagrant fancies, the Voyage of St. Brandan preserves a few significant facts. The island where were "the whitest and greatest sheep they ever saw," pasturing on luxuriant herbage never touched by frost, recalls the northern side of Teneriffe and its fleeced inhabitants, who lived mainly by their flocks, as depicted on the spot by Espinosa, whose work was first printed in Spain in 1597. A visit to a neighboring region, seemingly continental, is also related, whence the explorers carried away "fruit and gems." Now Africa, having both, is not very far away. Even more apt and explicit are the accounts of volcanic phenomenon; for example: "They saw a hill all one fire and the fire stood on each side of the hill like a wall, all burning." Such a picture might have been photographed within four or five years among the Canary Islands, and has many times been repeated during the march of centuries.

No doubt there are many islands having volcanoes, but not among the Bahamas. One might find some difficulty in discovering sheep, cliffs, active volcanoes, fruit, tropical weather, good pasturage, and an earthly paradise, all nearly together; but at any rate it must be conceded that no part of the world within reach of the saint, except the "Fortunate Isles" or their neighbors could probably supply the combination.

Espinosa relates traditions of the few surviving Guanches, concerning an early evangelist supposed to be an apostle (as in so many other instances); thirty people who landed long ago at Icod, "the gathering place of the sons of the great one," and the finding, before the Spaniards came, of a miraculous image, inscribed with uninterpreted assemblages of Latin letters; also a curious quotation from an unidentified calendar, which relates the sojourn in those islands of St. Brandan and St. Malo for seven years. The latter, it tells us, performed an ecclesiastical experiment in resuscitating the dead and damned, thereby learning uncomfortable things about "Hell"—and permitted his patient to die again (and finally) "in the time of the Emperor Justinian." The statuette (of the Madonna and child) above referred to, or a later substitute as some say, is still borne in religious processions about the island of Teneriffe; and withholds obstinately the message of its cryptic characters. Until these cipher writings shall have been read to some purpose, they obviously can not help to establish any connection with St. Brandan. Mr. Daly thinks the saint

and his companions may have brought the holy image from Ireland; but in view of the great gap of time to be accounted for, I incline rather to the entertaining Father Espinosa's artless declaration that angels brought it straight from Heaven.

In all this there is not much to be fairly called corroboration of the internal evidence of the medieval voyage-narrative; but it is certainly interesting to find the sixteenth century Spaniards of the Canaries well up in the legends of St. Brandan and St. Malo, and confident of their visit to those islands a thousand years earlier.

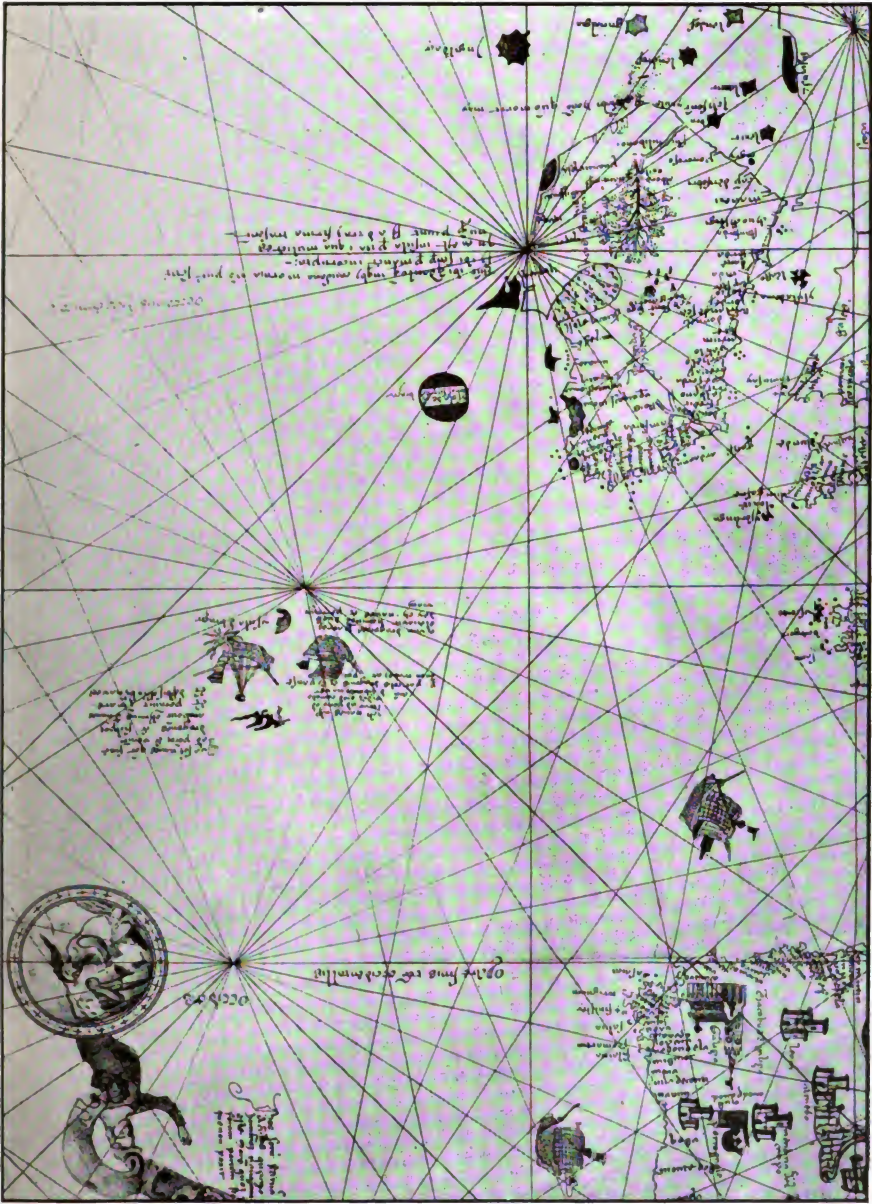
3.—THE MYTHICAL ISLANDS OF THE ATLANTIC

The only place where one can still see St. Brandan is on Pizigani's map¹ of 1367, bestowing his benediction, in medieval portraiture, on his "Fortunate Islands," thus named collectively in the map-legend, but individually as Ysola Caporizzia, Ysola Canaria, and Ysole douer Sommart. Possibly they were borrowed from Dulcert 1339 of Genoa, who calls the first-named island Capraria and the last Primaria.² The site of the latter is identical in both maps and approximately occupied by a cluster of rocks in a more modern one. Sommart (somma) is, however, more likely to indicate the peak of Pico; and the plural form Ysole may convey a sense of its less lofty Azorian companions. Whatever the explanation of this item, the cartographer of the Atlante Mediceo or Gaddiano map (1351) thought best to omit it; as does also the Catalan map of 1375. They substituted, however, for Caporizzia, Legname or d'Legname (Markland, forest-land) because of the great woods "de haute futaie" (D'Avezac)³ with which the early visitors found it covered, also the companion island becomes Porto Santo, as now, and Las Desertas have already taken their name as Insulæ Desertæ. Zuan da Napoli, whose map—that is, the Venetian one uncertainly attributed to him—is given by Kohl approximately the date 14—(perhaps of 1440 or later) translates Legname into Madera, its Portuguese equivalent, which, with a little change in spelling, still remains. It seems pretty clear that Madeira is the original Markland of Atlantic voyagers; also that it and its neighbor, Porto Santo, with or without some lesser com-

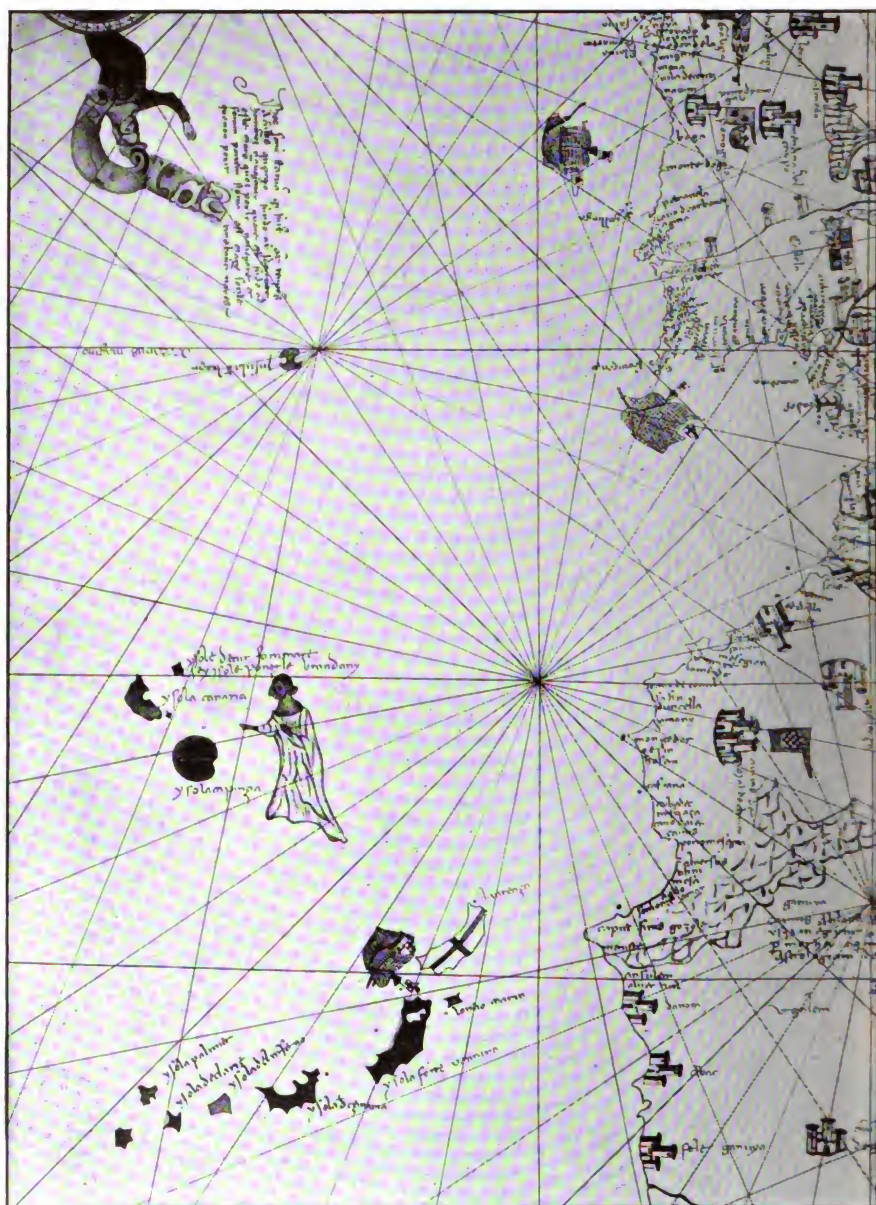
¹ Kohl's collection of maps in Library of Congress. Also Jomard's Atlas.

² Nordenskjöld's Periplus, pl. 8, also K. Kretschmer: The Discovery of America (Die Entdeckung Amerikas), Atlas, Tafel 1, pl. 2. Benincasa 1482 and others also show the Madeira group as three islands; but consider Las Desertas one of them, omitting Primaria or Sommart.

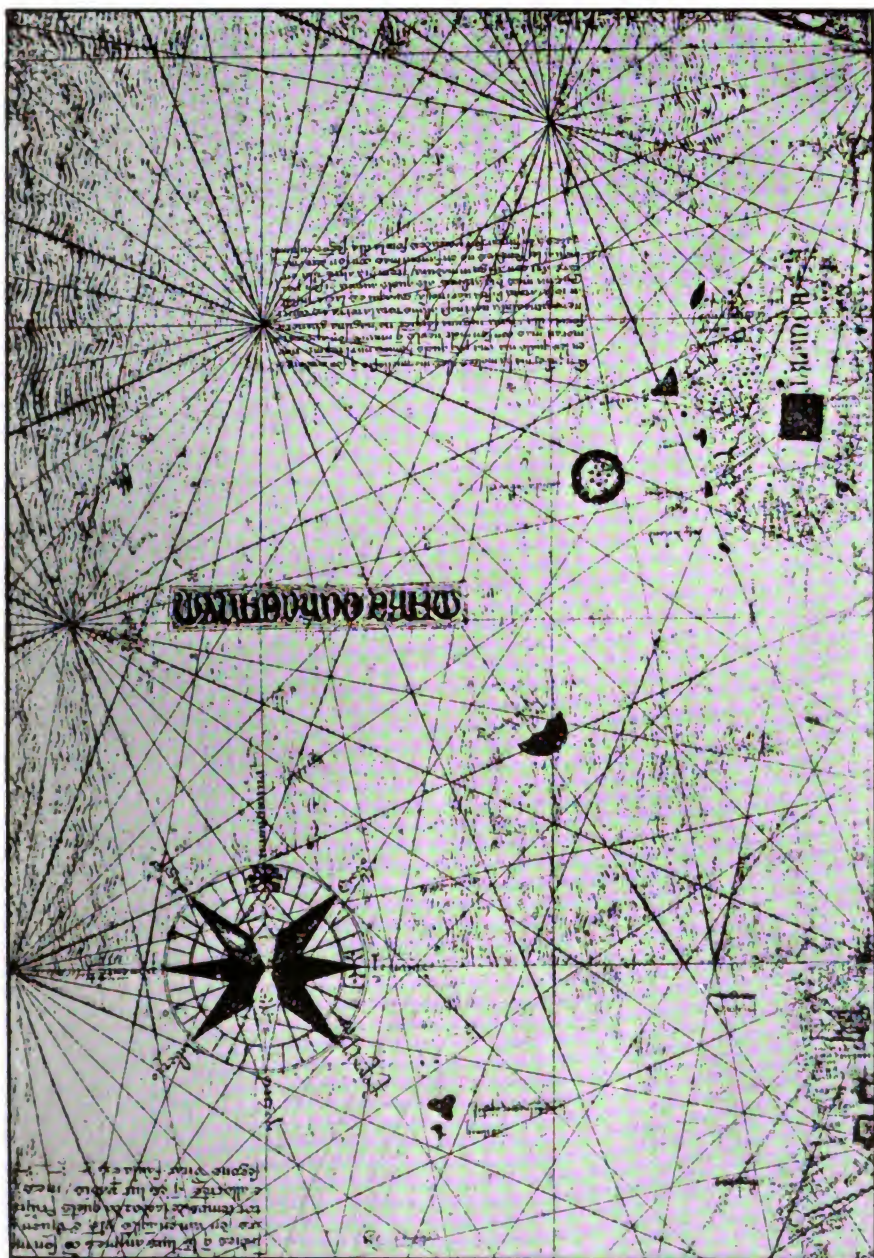
³ Marie D'Avezac: Discoveries of the Middle Ages, pp. 7, 8. The best reproduction is in Fischer's Sammlung. There is also a good one in Benzley's The Dawn of Modern Geography and an incomplete *facsimile* in Nordenskjöld's Periplus.



PART OF MAP OF THE PIZIGANI BROTHERS, 1671 (FROM JOMARD), ATLANTIC ISLANDS, UPPER PART
Showing Brazil west of south of Ireland ; also Brazir (Man) with ship, dragon, and kraken

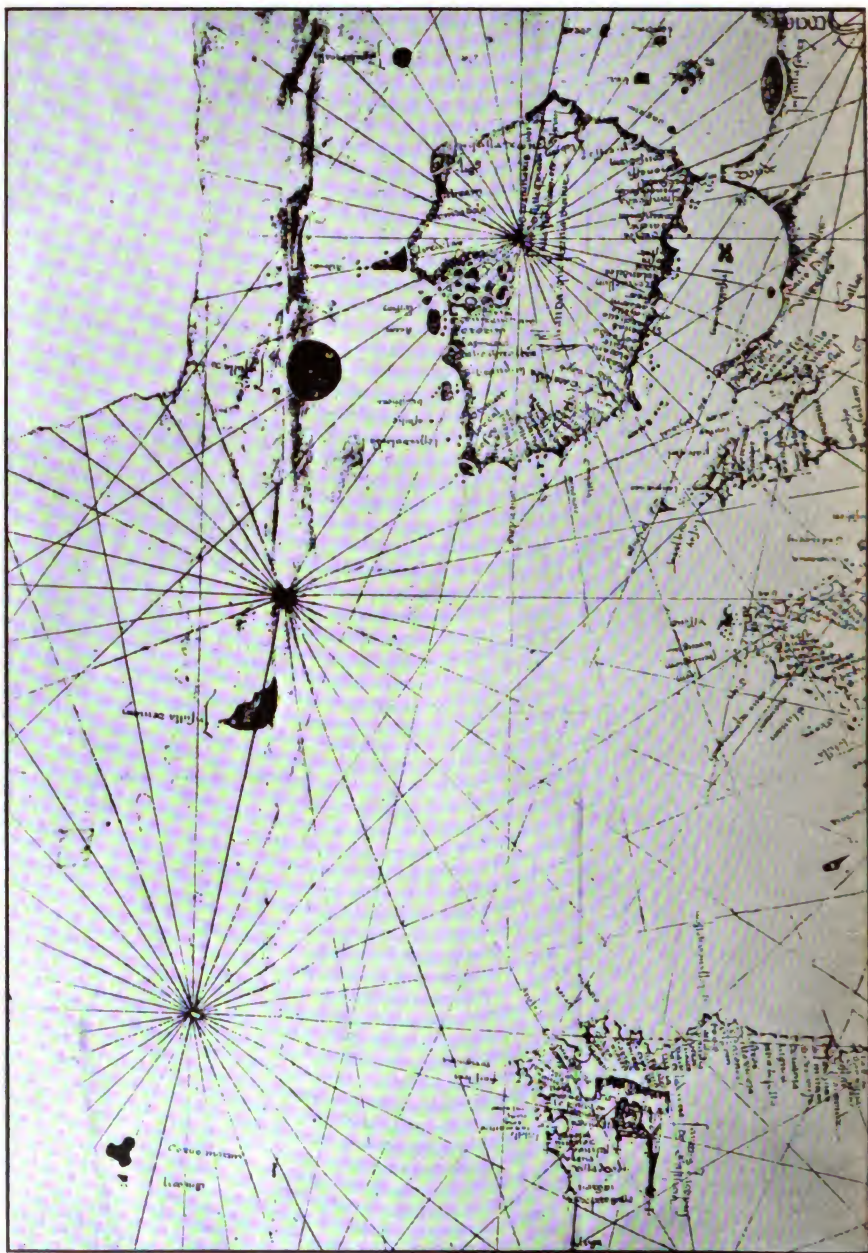


PART OF MAP OF THE PIZIGANI BROTHERS 1367 (FROM JOMARD), ATLANTIC ISLANDS, LOWER PART
 Showing angel warning against westward travel; also St. Brendan kneeling by his islands
 (This plate partly overlaps plate 1)



PART OF CATALAN MAP OF 1375

Showing the Island of Brazil west of the south of Ireland. Man and Corvo (with Flores as Il Congli) successively below. Brazil is annular, enclosing water and islets



PART OF MAP OF BATTISTA BECCARIA (BECHARIUS) 1435, UPPER PART OF THE ATLANTIC ISLANDS
Showing Brazil, Man, Cervo, and Flores

panions, were generally accepted by the conjecture or tradition of the fourteenth century as The Fortunate Islands and especially The Fortunate Isles of St. Brandan. This identification was afterwards forgotten, but the memory lingered that at least one island had borne his name, and we find it reappearing, in random fashion, here and there about the ocean at points where no island should be—a very elusive “*Ile fantastique*,” though not the only one nor the most significant; for “the mythical islands” are sown most liberally over the maps of five centuries. Thus Brazil, on a French map of 1754 holds nearly the same direction from Limerick as Dalorto gave it about 430 years before. Mayda (Asmayda) is even more persistent, for I find it in the old and proper latitude, opposite northern France, on a relief map, copyrighted in the United States in 1906.

As map-makers have generally followed explorers, with only a little toning down and conjectural improvement, we may safely take every additional island of the map as representing at least one voyage or the report of one. We know how the very dubious disclosures of the Zeni and the indubitable discoveries of the fifteenth century got into geography, though the former have since melted away. Also we can see how the medieval cartographers built up, item by item, a true island-showing for the eastern side of the Atlantic, so that even the 1351 map already cited,¹ has not only all the Canaries, but all their names, as now in use, with the single exception of Teneriffe. The islands which have not held their place in maps of the best authority are almost all islands out of place and duplicated, like the Island of St. Brandan, or bits of some more extended and more distant coast line similarly misunderstood. Thus the Sunken Land of Bus, named after one of Frobisher's ships² and long a disquiet to the mariner, since it could never be found again, is now generally recognized as a part of Greenland, which appeared unexpectedly before him when he was somehow off his reckoning. Several other and better known “mythical islands” are inadequately accounted for by any theory which does not cross the Atlantic.

In form and direction Antillia and Brazil are quite as constant as the Canaries, and more so than the Azores, of the early maps; which may show conviction arising from some previous precise narrative. Antillia, at its first appearance, is a large, elongated, rectangular, quadrilateral island with four indentations in its eastern side, three in its western side, each in two or three lobes, also a greater one at its southern end, all carefully delineated as if by survey; and it so remains, on nearly all the pre-Columbian maps. Sometimes this form

¹ M. D'Avezac: *Discoveries of the Middle Ages*, p. 42.

² Or possibly after one of his officers.

and the name also have been explained by the Atlantis legend, since Plato's description corresponds with it more or less. But there is no obvious reason why this influence should have been less potent in the fourteenth century, the quite numerous maps of which have no drawings of Antillia.¹ Humboldt argued against both suppositions and thought the name derivable from the Arabic "Al Tin," the serpent or dragon, a reminiscence of the terrors of the Sea of Darkness. In support of his contention he refers to the Island of the Dragon and like items. It is certainly true that Edrisi has a passage concerning that destroyer, killed, as he says, on one of the Azores by Alexander the Great; that the Pizigani's kidnapping monster is distinctly labeled "a dragon" and that even the much later Olaus Magnus² decorates one issue of his history with a pictured saurian having a serpent's tail, in the act of dragging a sailor from a ship's deck to its lair on some rocky Atlantic shore. Evidently huge reptiles of the lizard kind were associated in human minds for five or six centuries with the perils of westward navigation. This of course may mean no more than a play of fancy about memories of crocodile-haunted African rivers; though it may also conceivably record impressions left by far western islands where similar forms were at least equally common. D'Avezac,³ reviewing the matter of etymology in 1845, dissented from Humboldt's hypothesis; which does not seem to have been taken up zealously by any advocate, notwithstanding the very great eminence of its author. Perhaps it has been regarded as ingenious, rather than perfectly reliable, for the transformation of Altin into Antillia is not adequately explained.

A more plausible conjecture, probably the most nearly convincing one thus far offered, makes up the name in Portuguese from Ante or Anti (before or opposite) and ilha Island. On some maps the latter word regularly becomes illa—for example that attributed to Zuan da Napoli,⁴ already mentioned. By either spelling, the pronunciation in full would presumably be Anteillia or Antiilia, readily compressed to Antillia, after the manner of all languages when two similar vowels come together. Obviously this derivation has the advantage of simplicity and the case as to meaning is equally good. Divers early maps—as Battista Beccaria (Becharius) 1435, Bianco 1436, Pareto⁵ 1455, Roselli 1468, Bertran 1489, and Benincasa, 1482—show Antillia,

¹ Jomard: Atlas, Plate 11', Pizigani Map of 1367. An obscure Latin inscription on it contains, however, the word Atullae or Atille, identified with Antillia by Kretschmer and others.

² J. Winsor: Narr. and Crit. Hist. of America. vol. 1, p. 74; Tillinghast's Monograph.

³ Les Iles Fantastiques, p. 27.

⁴ Kohl's collection of maps in Library of Congress.

⁵ K. Kretschmer: Die Entdeckung Amerikas, Atlas, Tafel 4.

thus named, out before the Azores and opposite Portugal across a great expanse of sea and curiously duplicating that kingdom in length, breadth, minor details, and rectangular outline. Benincasa adds to the appearance of accuracy by inscribing at intervals names, perhaps of provinces, on all parts of this large island, but seemingly with special reference to the bays and their neighborhoods, as well as on another of similar general form, though shorter and narrower, which lies to the northward somewhat farther than Florida from Cuba. Bianco had called this rather fearsomely *La Man de Satanaxio*, commonly rendered *The Island of the Hand of Satan*, a name abbreviated to *Satanta* by one much later geographer and even changed to *St. Anna* by another, both necessarily of but secondary authority in such a matter. Benincasa, however, reverts to the earlier name *Salvagio* or *Saluagio* of Beccaria, changing it slightly to *Saluaga*. Presumably in both cases the "u" should have the value of "v," as was common usage then and long afterward.

This Beccaria¹ (Becharius), was the first delineator, so far as we know, of this highly significant Antillian group of large far south-western islands. He makes them four in number, including a relatively small, but considerable island, north of *Salvagio* marked I in *Mar-Sea Island* (or *Islands*), literally "in sea"—and *Reylla* (*King Island* or *Royal Island*), bearing, in area, form, and position, approximately the same relation to *Antillia* that *Jamaica* bears to *Cuba*.² He also applies to the whole group the conspicuous legend *Newly Reported Islands—Insulle a Novo Repte.*, which recalls the note accompanying *Antillia* on Behaim's globe of 1492, prepared while Columbus was yet at sea on his first voyage, to the effect that a Spanish vessel visited this island in 1414. Nordenskjöld quotes also an anonymous map of 1424 at Weimar, which Santorem has copied in his atlas, but without *Antillia* by reason of incomplete westward extension; but the present Weimar librarian considers this to be certainly the work (perhaps about 1481), of Freducci, a map-maker of the latter half of that century.³ Another map by Freducci made after the earlier

¹ *Studi Bibliografici e Biografici*, containing papers of 1st and 2d Italian Geographical Congresses, with maps appended, plate 8.

² Roselli 1468 shows all four islands, though the outline of his Roills is faint. The original map is in the collection of the Hispania Society of America, New York. Bertran, as reported by Kretschmer, gives it a different name.

³ My photographic copy of the original, made in Weimar, shows the upper half of *Antillia* with the name in full, the lower half of the island being cut off by the parchment border. *Salvagio* above it is in full outline of usual form, but with only S legible.

voyages of Columbus is considered by him to show Antillia as of the real Antilles. The slightly later (1500) map of Juan de La Cosa may preserve another echo of the tradition recorded by Behaim in his entry "this is the island that the Portuguese found" applied to an unnamed outline of the orthodox rectangular form of the eastern South American coast, for he could hardly yet have heard of the landfall of Cabral. Finally, we know that Las Casas, the friend of Columbus, promptly applied to Cuba and its companions the term *The Antilles*, which they bear to this day and that other contemporaries believed he had reached the Antillia which Toscanelli recommended to him in advance as a convenient stopping-place on the way to Asia. All things considered, it appears that Nordenskjöld had some solid ground of justification for classifying all the maps of *Periplus* which contain Antillia, under the heading "Maps relating to the New World" (see note 1, p. 176).

Antillia and its consorts cannot be the Azores, which in each instance are shown half way out to them or not much less, the remotest pair of the latter, Flores and Corvo being similarly situated in reality with regard to some points of the American shore. Furthermore these Portuguese islands are in each instance represented of about the proper size, being indeed evidently well understood except as to the western inclination of the extended Azorean series. This is not strange in view of the amount of coming and going among them at that time, Beccaria's earliest date being about sixty years after¹ the establishment of the Norman trading post Petit Dieppe on the African coast far below, followed by frequent voyages thereto while the Basque and Breton fisheries were carried on in a lively way in those seas. The Italians also had been up among them, leaving names for all the islands, and now the Portuguese were taking exploration and colonization earnestly in hand. But far beyond these Azores there was obviously, in their settled belief, something very much greater, aptly defined as in front of Portugal, and the Azores, since it extended from the parallel of Lisbon or higher, to about that of Gibraltar or a little below. The Antillia of Beccaria and his successors may well be rather too far north. Discoverers, knowing nothing of the dip of the isothermal lines southward on the western side, would be likely to judge by climate and productions, thus erring in the latitude; and it is easy to see how an opposite mass of land reported to resemble Portugal in bulk, and conditions, might be conventionalized by the map-makers into greater resemblance. A royal grant of 1486 even

¹ Nordenskjöld: *Periplus*, p. 115. Cf. M. D'Avezac: *Discoveries of the Middle Ages*.

refers to Antillia as possibly part of another continent.¹ The facts above presented seem to me to point to the region of the Greater Antilles, as we very appropriately call them now, perhaps with a part of the neighboring mainland and lesser islands outlying at sea, but there is no need to work out this suggestion more particularly. The names of the chief upper island have puzzled geographers, but if savages were there and acted after their kind we need find no great difficulty in accounting for Salvagio or The Hand of Satan; and all later forms apparently grew out of these.

Nansen's *In Northern Mists* condenses from Diodorus a tale already mentioned, of a Phenician ship driven by tempests to a region opposite Africa, which had both mountains and lowland tracts, and abounded in the lavish gifts of nature. This description would fit the West Indian region above mentioned, though hardly anything above it on the American side. However, it may equally well have been developed out of the reported facts of a traditional accidental visit to Madeira. Nordenskjöld will not say as much for Brazil (the original one) as for Antillia, yet it has a case that cannot be ignored. The former island of the map rarely, if ever, wanders into southern waters, and is nearly always west or south of west of Limerick in the early maps, at an apparent distance which is absurdly small. But the fourteenth and fifteenth century cartographers had a cautious habit of minimizing distances, the perfectly well known Corvo, for example, being generally shown (with that name as Corvi Marini, Corvis Marinis, or Corvo Marinis), very much nearer Spain than it should be. The Piziganis (1367) show both, also Brazil in the usual form and place besides the more southerly "Ysole Brazil" apparently Man, to judge by its crescent form and location, though farther out than usual and doubly puzzling by the approximate repetition of the upper name and the use of the Italian plural where but one island is shown. This part of the map shows a dentapod kraken dragging a seaman from a ship, a dragon heart and an angel warning navigators back; with a frantic though obscure inscription denouncing the dangers of sailing westward.

The original circular Brazil, west of southern Ireland, is said sometimes to have been called "great," by the medieval Irish,² reminding us of "Great Ireland," which was in the same quarter or near it; and it was believed to be of such promise and importance that numerous expeditions were sent forth in search of it by the merchants of Bristol during the period between Botoner's failure in 1480 and Cabot's

¹ E. J. Payne: *The Age of Discovery*. Cambridge Modern History, vol. 1 p. 20.

² See note 2, p. 176.

success in 1497. His small ship *Matthew* won through the storm-belt to the region about the Gulf of St. Lawrence; and he evidently felt that this was Brazil, for he uttered hopeful forecasts of finding silk and brazil-wood. Since it was midsummer, the extravagance of this would be hidden; besides, his ideas were no doubt colored by acquaintance with lovely, dye-yielding, forest-clad, fortunate islands of the eastern Atlantic, and his words were perhaps meant chiefly for more southward points than his first landfall, since he may have voyaged a considerable distance that way.

There are certain features of this Brazil most naturally explained as imperfect delineations of that outjutting elbow of North America which includes the Gulf of St. Lawrence, although no one seems to have noticed what they indicate. Thus the Catalan atlas of 1375 shows Brazil not as a solid land, but as enclosing a sheet of water in which several isles appear. Nordenskjöld¹ says they are seven in number, and reads them as derived from the legend of the Island of the Seven Cities, giving no authority except his own fancy. But this Brazil is too far north for the Spanish story, which most likely had to do with one of the Azores or Madeira, being perhaps an exaggeration of some real migration of escape, such as would be nearly certain to occur at the height of the Moorish conquest. Besides, seven towns do not require an equal number of islands in a great lake or an inland sea. The Spaniards themselves felt no incongruity in hunting for those cities, in 1539-40, among the deserts and mesas of New Mexico.

Again, several maps, for instance Prunes's² 1553 and Mercator's 1595, show Brazil as divided into two islands by a passage or channel. For this also we have a mythological explanation (by Dr. Nansen³)—namely the "river of death." But again the conjecture is quite unsupported. Yet again, in several maps, Brazil has a space marked on it after a quaint early fashion of indicating mountainous regions and other natural features, and this bears the inscription *Montorius* or *Mont orious*, apparently meaning at least, that a portion of Brazil was mountainous. But the map of Dalorto 1325 or 1330 gives its name in full as *Insula de montonis siue de brazile*.⁴ (See note 3, p. 176.)

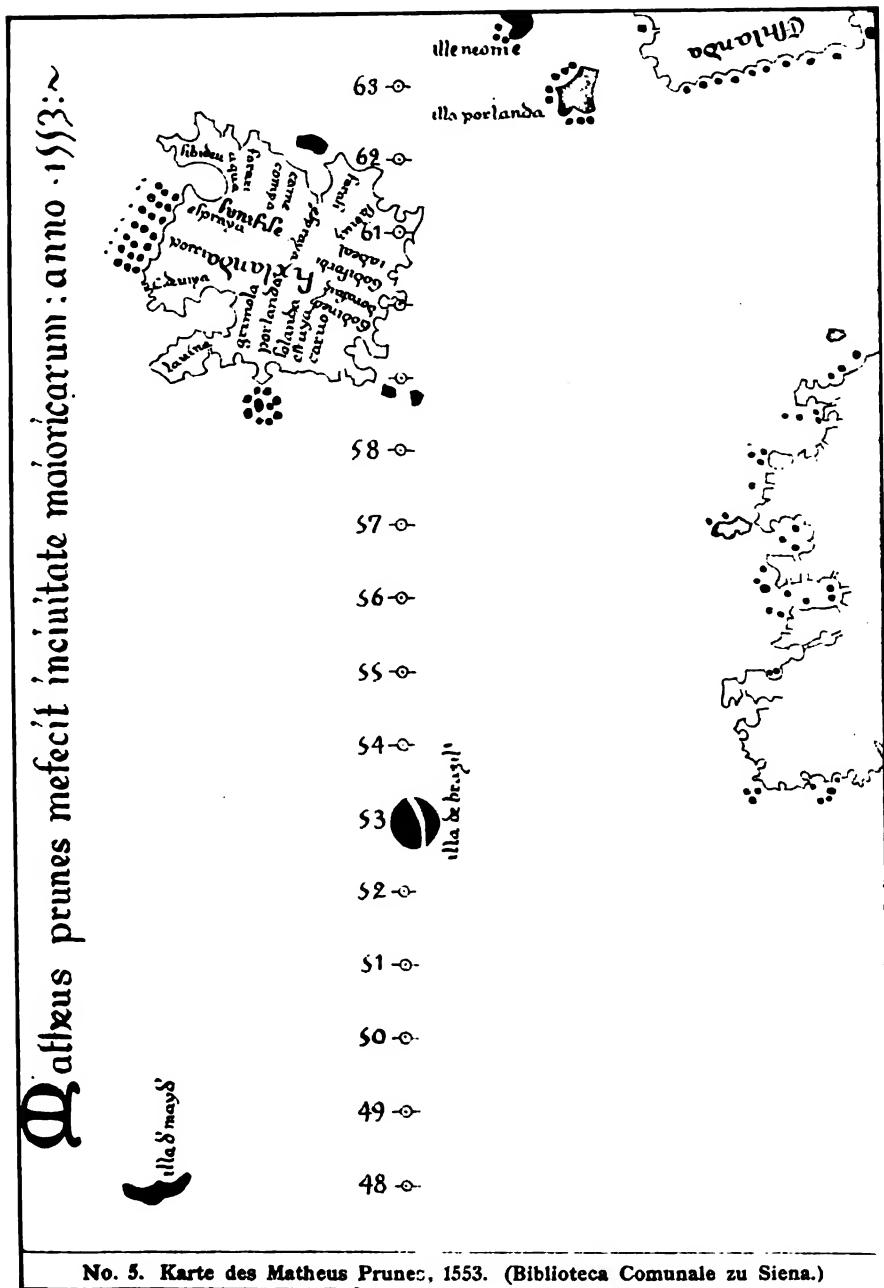
If, now, we apply these several distinctive features to the region reached by Cabot, we find this outjutting corner of America surrounding the Gulf of St. Lawrence, which contains Prince Edward's Island and the Magdalen Islands, Brion Island and others. Its east-

¹ *Periplus*, p. 164.

² K. Kretschmer: *The Discovery of America*, Atlas, Tafel 4, map 5.

³ In *Northern Mists*, vol. 2, p. 228.

⁴ *Ibid.*



ward wall is divided by the Strait of Cabot; and the great estuary of the St. Lawrence, dividing the opposite side, might well be thought a continuation of that channel and to lead out again to the sea. Just this was in fact supposed down to Cartier's voyages or later. We are now aware that only the front of this elbow of the continent is insular (Newfoundland and Cape Breton), but it was inevitable that in all the centuries before the seventeenth the whole tract, if known at all, should be regarded as an island. The circular external outline may have been some mariner's guess from the curvature of Newfoundland and Nova Scotia considered together, and the scollops, serrations, or indentations of this outline presented by many maps may indicate a memory of real bays and inlets, though fancy would be ample for supplying them. As to the mountains, there are considerable elevations along these ocean-fronting regions, and they grow distinctly impressive beyond the Bay of Fundy, still within the land-wall of the St. Lawrence Gulf.

We have, then, in a real region, and in only one, the several peculiar features above stated, each offered also by a group of old maps—as though every observer had individually contributed what most particularly impressed each of them, and was most vividly remembered: and there is nothing in geography or in the circumstances of those times to make predecessors of Cabot, crossing as he crossed, impossible or very improbable. Indeed, that particular part of America always held itself out conspicuously, tempting discovery. The coincidences may be nothing more; but the speculation has probably a sounder basis than any other advanced thus far concerning this very suggestive "island."

Some investigators, considering Brazil a reality of the past, have explained it in another way, making it a lesser Atlantis of more gradual submergence, a veritable "sunken land," which went slowly down, leaving no more to show for it now than the lonely, bare, granite peak of Rockall, best described by Mr. Miller Christie in *The Scottish Geographical Magazine* for 1898. He does not, however, suggest its identity with Brazil. According to a globe which he has found, there seems to have been a sand-bank visible (at least sometimes) on the spot three or four centuries ago; but nothing could have been there in the historical period to warrant belief in the great Brazil; its crags must have been frequently in sight of those who sought the latter; and the situation must always have been too inclement. Porcupine Bank has also been presented in this connection, but with even less plausibility, being too near the Irish coast, too ancient in its visibility, too much out of the right direction from

Limerick, and also apparently indicated on at least one map which distinctly shows Brazil also, farther afield.

The name, Brazil, has been the subject of much discussion and has led many on a quite misleading trail. For a generation or so after the first appearance in cartography of the original Brazil off Ireland, so far as known, the maps begin to show a second or emulative Brazil off Portugal, and with much the same relation to Lisbon as the other had to Limerick. Its name varies, as might be expected, from Brazi and Bracir to Buxelle, for the word was a foreign importation. Probably this island¹ was Terceira of the Azores, where dye-woods abounded and which seems to be the Bracir opposite Spain of the 1367 Pizigani map, a mountain there still bearing the name Brazil. A second island in that group was named the same perhaps for like reason, any kind of red dye-wood being known as Brazil-wood; and there were other instances of such naming, the latest holding its ground sturdily even yet in eastern South America. It is evident that from the middle of the fourteenth to the beginning of the sixteenth century, any region named Brazil would be expected to yield Brazil-wood or other vegetable dye, such as orchilla, in justification of its name. So it is not surprising that we should be bidden to seek the derivation of the first Brazil in just such material for dyeing.

But here the clue fails; for the origin of the word itself is still to seek. The only tenable explanation thus far given makes Brazil a coalescence of two long obsolete Irish Gaelic words, *breas* (Prince) and *ail* (noble—besides other meanings), *Breas* also having been in ancient use as the proper name of many chiefs and eminent men. The Irish local name usually prefixes *I*, or *Hy*, meaning "country," and more particularly "island," from *Inis*, the Gaelic equivalent of *Insula*, *Isola*, *Ysola*, or *Ilha*. It might not be safe to translate *I. de Brazil* as the Island of the Noble Prince or the Noble and Princely Island; but the general intention of extolling its merits is undeniable, and, on the fifteenth century map of Fra Mauro we even find a Latin legend declaring it to be *Berzil* the fortunate island of the Irish. In all this there is certainly something more than admiration of a salable commodity which might be gathered by the shipload and used for dyeing. Furthermore, nobody would have thought, in the beginning, of expecting such dye-woods or equivalent material approximately in the latitude of Ireland. After centuries of association between the name and the article, the case was very different (see note 4, p. 176).

¹ M. D'Avezac: *Discoveries of the Middle Ages*, p. 35.

The true history of the matter seems to have been as follows: The original Brazil, west of Ireland, was found some time (probably very long) before 1325 and named admiringly. Afterward, in emulation, the same name of high praise and celebration was applied to the beautiful island of Terceira, where a mountain bears it still. The abundant dye-material¹ of the latter came to be known by this geographical name (as india rubber is, wherever obtained); other islands which had the like were called Brazil, and at last it was hardly possible to think of that name without thinking of the dye. This came about early and effectually among the South-European geographers, who had borrowed an Irish word without knowing the Irish language. We find *Brazir* and *Brazile* as their pretty fair guesses at the true name of the original island, besides the more aberrant forms already mentioned, which were generally applied to the later and derivative Brazils nearer their own shores. Thus Brazil-wood has nothing to do with the original naming; but the island name has everything to do, through another and namesake island, with the naming of the widely sought and greatly coveted dye.

From the middle of the fourteenth century, Brazil had usually a crescent-shaped consort on the maps called *Man*, *Mon*, or *Mam*, located farther to the southwest and about in the latitude of Brittany. This has been sometimes identified with that similarly located and most persistent *Asmaida*, *Mayda* or *Mayde* which Humboldt thought to be of Arabic naming and diabolical significance; and certainly having names in two languages need be no more surprising in this instance than in that of *Madeira*, or *Teneriffe*, or *Flores*. Indeed, *Man* with its distinctive form, appears in one old map as *Joncele*; and *Mayda* in a later one as *Vlandoren*, showing that navigators of still other tongues had taken their turns in reporting. It must further be said for *Mayda* that even in a mid-eighteenth century map it retains the old station of *Man* southwest of Brazil; but, on the other hand, it is not usually of a distinctly crescent form.

Sometimes, too, *Man* has been identified with the island north of *Antillia*, the full name of which is understood to be *La Man de Satanaxio*; but this is most likely a case of mere verbal coincidence, helped out by their share in a common evil repute, to which the Devil Rock, still appearing on some maps in this quarter, may bear witness. But the existence of this rock is apparently disproven, as the United States Hydrographic Office informs me. At any rate, on the fifteenth century maps of *Beccaria*, *Benincasa*, and *Bianco*,

¹ See Note 5, p. 176.

both islands are shown, although of very unlike aspect and in widely separated regions of the sea. It is altogether more likely that the name Man is Gaelic in this instance, as in that of the well known island in the Irish Sea, especially as its nearest and most constant neighbor Brazil is Gaelic too; but the "Man" of Bianco's long name is doubtless correctly rendered as Latin in origin. This would not, however, prove a different original meaning, for "Man" is said to mean "Hand" in obsolete Gaelic also.

If all this curious shoal of names and islands having to do with Man in name or in form and location must indeed be considered as one then assuredly is that one the most protean, elusive, and bewildering of the whole "mythical island" display. It seems more readily conceivable to suppose they have grown out of two or more glimpses of land, at widely separated points and by men of different nations and languages who sometimes used a syllable in common, though with different meanings; and there is nothing in this to preclude those shores from belonging to a single far extended line, continuous or broken. A guess at Satanaxio has already been given. Similarly we may say that if Brazil be the region about the Gulf of St. Lawrence, we might possibly find Man in the Bermudas, though the indications are too faint to warrant more than a diffident suggestion (see note 6, p. 177).

Reviewing the general field of these islands that for so long have played their little jests with geography, it seems altogether likely that, before the acknowledged historical discoveries of the Antilles and North America, there had been crossings and recrossings of the Atlantic at various times approximately along the routes of Columbus and Cabot; possibly also on one or more intervening lines. The vague intimations which they gave in the figures and traditions of Antillia and Brazil undoubtedly spurred on both of these men; and probably one or more of them had, far earlier, through the related Great Ireland and its legends, made certain the discovery of Markland and Wineland by the Icelanders. But we have no surviving narratives of these previous voyages which may be tested by their data of natural history, ethnology, and coastline features as we test the voyage-narrative of Thorfinn Karlsefni.

4.—THE PROBLEM OF GREAT IRELAND

We acquit St. Brandan of finding America, but the fact remains that for probably more than five centuries men believed in a Great Ireland far west of Ireland over sea.

Two native boys, captured in Markland, an American region, according to the Saga of Eric the Red and the Saga of Thorfinn Karlsefni, told, about the year 1006 of a country beyond their own, where people wore white garments, carried rags on poles and shouted ; from which it was inferred that this must be the already known or rumored White Men's Land,¹ sometimes called Great Ireland. We may suppose that these little prisoners were merely echoing what they heard from the Norsemen around them, to find favor with their masters. But this would equally prove what was then the prevailing tradition.

We know that the early Irish Church was the lamp of faith for all the west ; that St. Patrick's conquest of the island for Christ aroused in it a wave of militant Christian emotion, becoming in some souls an eagerness to spread the gospel, in others a wild hunger for solitude, where life might be as nearly as possible an unbroken trance of religious ecstasy ; and that these combined motives drove little shiploads of religious mariners out in all directions with most abandoned recklessness. The Norse rovers were counted the hardest and boldest men of all the world, but they could find no place where these Irish had not been before them. It was so in the Orkneys, in the Faroes, and in Iceland—and their holy-isle off shore from this latter home is still named for them. A well-known passage of the *Landnamabók* records their withdrawal, apparently between the years 885 and 1000, leaving Irish books, bells, and croziers behind them. But that is not their earliest. Dicuil, the monastic Irish geographer, mentions meeting, a hundred years before, one of the brethren who had been to Iceland ; also there are items, of uncertain value, in various quarters concerning an alleged Irish settlement on that island a century earlier still.

In view of what they really achieved, their known fearlessness and very special impulsion, why should it be incredible that in one thing more they should outstrip all others, reaching at some point the mainland of America, though they might not be able to return, and their settlement must die out if reinforcements failed ? If their supplanters in Iceland, the Norsemen, had not recorded the presence there of these ecclesiastical Irishmen it is likely that we should be debating it to-day, though it continued so long.

In the beginning of the *Heimskringla* ²—"one of the great history books of the world," as Dr. Fiske has called it, in a portion recognized

¹ See Dr. Brinton's early article in *Historic Mag.*, vol. 9, p. 364 (1865), identifying with Carolina by reason of Albinos.

² Laing's translation of *Heimskringla*, vol. 1, p. 216.

as presenting very ancient material, we find a parallel use of the name "Great Sweden" for an immense region, the nearest to Sweden southeastward across the Baltic sea; just as Great Ireland was conceived to be nearest to Ireland across the ocean, southwestward. This Great Sweden was peopled with myths and monsters no less uncanny and disturbing than the deadly Uniped which drove an arrow into Thorvald Ericsson, or the big-eyed apparition of menace or warning which inflicted herself on Gudrid beside the cradle and the baby, as the Flateybook story will have it; a region obviously little known and open to doubt, yet occasionally reached by Swedes. There is no question now concerning the reality of this Great Sweden, nor that the references to it are historic in a way, for it is simply Russia. Dr. Storm¹ also observed this coincidence and added Magna Graecia as another example; but somehow he remained of the opinion that Great Ireland was a myth or a mistaken remembrance of Iceland.

An old manuscript (codex 770 of the Arne Magnean collection), quoted by Rafn's *Antiquitates Americanæ*, is fairly explicit as to locality:

Now there are, as is said, south from Greenland, which is inhabited, deserts, uninhabited places and icebergs, then the Skrellings, then Markland, then Vineland the Good. Next, and farther behind, lies Albania, which is White-men's Land. Thither was sailing formerly from Ireland; there Irishmen and Icelanders recognized Ari, the son of Mar and Katla of Reykjaness, of whom nothing had been heard for a long time and who had been made a chief there by the inhabitants.

This appears to have been prompted by the following brief narrative in the *Landnamabók* of Ari the Wise (a descendant of the vanished man) who died in 1148. His *Islendingabók* says the same, only omitting the sources of information:

Their son was Ari. He was driven out of his course at sea to White-Men's Land, which is called by some persons Ireland the Great. It lies Westward in the sea near Wineland the Good. It is said to be six doegrs sail west of Ireland. Ari could not depart thence and was baptized there. The first account of this was given by Rafn, who sailed to Limerick and remained for a long time at Limerick in Ireland.

Ari the Wise adds that Thorkell Gellison, his own uncle, had heard the same story from Earl Thorfinn of the Orkneys.

There is a parallel episode in the *Eyrbyggja Saga* (perhaps a fragment of the lost saga of Biorn the Broadwickers' champion) which has sometimes been thought a mere elaborated echo of the

¹ G. Storm: *Studies on the Vineland Voyages. Mémoires Société Royale des Antiquaires du Nord* (1888), pp. 307-370; also separately 1889.

above, though Vigfusson in *Origines Islandicæ* treats the events as different, while reckoning both disappearances to be a little earlier than Leif's voyage to Wineland. The ship of one Gudleif, it seems, having sailed out of Dublin, was driven by storms to a western land where, after some risk from the inhabitants, they were greeted by Biorn, who was now a chief in his new country, but who warned them away as from a place of danger. Without giving his name, he inquired particularly about a certain woman, who was the cause of his exile, and about their son, sending messages to both. In conclusion, the saga tells us that there was no proof of their story, but that most people believe they went to Great Ireland. Vigfusson¹ appears to accept this guarded statement as presenting a fact; but Reeves² does not feel the identification at all certain; and doubtless it is not. As to internal evidence, Biorn was on horseback, banners were carried before him and his people spoke a language like Irish: so wherever Gudleif went, if there be any truth in the details, it was not to America. We may most safely treat this story as adding no data to the material in hand, but merely borrowing from the better authenticated legend of Ari Marsson, in developing an edifying sequel to a well known Icelandic romance of reckless and lawless love.

Taking the passages above quoted with the Sigurdr Stefánsson map, hereafter more fully treated—which shows Helluland, Markland and the upper part of Wineland, and bears traditional notes of the latter's extension southward to the "wild sea" and to a "fiord," separating it from the "America of the Spaniards"—we might conjecture Great Ireland to be New Jersey, or the eastern shore of Maryland, or Virginia south of the Chesapeake, according to our choice among the "fiords." All are in the deep concavity of the coast line between Cape Cod and Cape Hatteras; all consequently lie below and behind the southern sea front of New England and Long Island. But precision can not really be insisted on; for Stefánsson must have had very vague ideas of everything below Cape Breton, or else his drawing would have been extended in that direction. The notes are perhaps by another hand, but if so represent equally well the national tradition. However, Beauvois's conjecture locates Great Ireland on the St. Lawrence. Others have located it in the Mississippi Valley, or some part of Ireland itself. Storm thought it a sort of reflection or adumbration of Iceland. But all non-American identifications of this region seem rather far-fetched.

¹ Vigfusson and Powell: *Origines Islandicæ*, p. 23.

² A. M. Reeves: *The Finding of Wineland the Good*. Final Notes.

The Ari Marsson story is one of the questionable things which nevertheless may be true. Earl Thorfinn would undoubtedly give his best information to a descendant of the lost man; but we do not know whether he merely repeated Rafn or had learned independently. The latter's account was earlier than Thorkel's we are told, but there is no pretence that this Rafn knew anything personally or made any close inquiry. Vigfusson decided that he was not an Iclander; and nothing seems to be known of him, except that he heard the story in Limerick, presumably from seafaring people, and carried it to Iceland. Now this is the city obviously linked with the Island of Brazil by the implication of the earliest fourteenth century maps.

But it is not in Limerick sailors' yarns, however possible, nor in parallel nomenclature, however significant, nor in obvious inference, popular belief and geographical statements or representations having no assured basis, to establish an important fact of history. One must feel that Irish monks, blinded to everything beyond their absorbing purpose, may very well have been here before any Norseman; but it seems at present beyond proving.

Yet there is no warrant for treating Great Ireland as assuredly unreal, and reasoning therefrom by analogy against Wineland. The inability to prove is a different thing from conclusive disproval; and we are so far from the latter that the preponderance of probability leans the other way. Great Ireland, White Men's Land, or Albania is simply an asserted region like the Island of Brazil, believed in for a long time by many people likely to have some inkling of the truth, but which, unlike Brazil, did not find its way into maps drawn by men of southern Europe. Great Ireland and Brazil Island may well be near neighbors, or overlapping names for parts of the same coast. But at present we should hold the matter in abeyance for further light.

5.—THE COLONIZATION OF GREENLAND

Toward the end of the tenth century various things combined to bring the Icelanders to America. The insular stepping stones out from Europe had grown more familiar than remote districts of their own island; the habit of voyaging in every direction but one made that exception an anomaly which could not last. Furthermore, the aggressive missionary spirit of Christianity was rising and reaching forth, especially from Norway. Iceland thus far had held out nominally, in a spirit of conservatism, for Odin and his wife and the tremendous warlike Thunder; but King Olaf¹ was urging his new doctrines, with appeals to commercial advantage and menaces of

¹ Heimskringla. Laing's transl., vol. 1, pp. 427, 445.

personal disfavor, which could not be without effect even in dealing with an independent community, since its independence was a little uncertain and it was linked to the parent country by many ties. His personal prestige counted also; why need any one hesitate about serving a Heavenly King whom even the redoubtable Olaf of Norway delighted to follow? Already he had many island adherents and the end was plainly near. It is curious, but hardly a matter of surprise, that the same year witnessed the formal adhesion of both Iceland and Greenland to the Christian faith, as well as the incidental discovery of America by a newly converted missionary sea-captain, a son of Eric, sailing out to the latter country with the message of Christ and King Olaf.

Turning back a very little from this, the Iceland of the year 980 and thereabout was in the very flood-tide of population and hopefulness, even afflicted with an excess of strenuous enterprise and uncompromising self-assertion, which made every neighborhood faction eager to fight for its sentiments at a word, every man painfully concerned in distinguishing himself and his steel sword on others, every member of a family bound to avenge any wrong or slight to its least appendage or take vengeance indefinitely for some retaliation perfectly warranted by their own code.

The last word is significant, for the thing itself was rarely lost sight of. The distorted and bloody law-abiding spirit of the Icelander has been often commented on as almost unique in history. He had inherited a common law, and so venerated it that he sent an envoy early in the island history to Norway for more perfect enlightenment. This man brought back a slightly modified code. It caught the popular fancy wonderfully and became a great factor in their daily lives, though its precepts and the decisions under them for the most part were carried in memory only. A singularly artificial system of pleading and practice grew up, every one being a stickler for exactness of procedure and treating legal formulas as of quite magical efficacy—witness the effective but unintended declaration of truce which the adroit Snorri the Priest, in the Saga of the Heathslayings, entraps a conceited memorizer into declaiming, before the latter knew that his most deadly enemy was beside him.

Most of the sagas are indeed almost as much the histories of litigation as of private war. The two things went together. Duelling was fully recognized and relied on as one means of settling disputes—even at first, of acquiring and holding other men's wives and property; while the blood feud seems to have had a semi-legal status, gradually losing ground in theory but remaining popular, so that

everybody indulged in it, although a dominant party or leader would sometimes use a tribunal to ruin an opponent for having done so.

Eric Raudi (the Red or Ruddy) had his full share of troubles, and was never long without belligerent experiences proper to a spirited Iceland gentleman—which is about all that can be charged against him. Relatively blameless and most useful men appear sometimes to have been unjustly driven to the lava fields and ice mountains, as in the case of Grettir, who robbed those who expelled him, that he might live.

Eric does not come into view as an aggressor. He had left Norway with his father, as the best way to escape a feud. In his first Iceland home the beginning of tragedy was a landslide or avalanche that did some damage to a neighbor's land, whereupon this neighbor laid the blame on two slaves of Eric—probably Britons or Gaels—and killed them incontinently. Eric flared up in fury and killed the slayer. This brought about the usual turbulent "lawsuit," and Eric was exiled from the district; making his new home on Oxney (Ox-island) in the great southwestern Broadfirth.

But he did not keep out of trouble. A friend borrowed from him a pair of heraldic door-posts, used occasionally, too, as ship's figure-heads—or possibly picture-carven sections of those partitions, often strikingly ornamented, that made up the box-bed enclosures in which our modern separate sleeping rooms find perhaps their origin. They were valuable at any rate, and the borrower prized them no less than he; so refrained from returning them as desired. In the end red-headed Eric went to the false friend's house with a party and took them away. There was a rally of the affronted household; pursuit, sword in hand; a small battle in the highway, in which Eric cut down a man or two—thereby winning distinction as a brisk champion, not to be imposed upon, but also unlimited persecution and disaster.

He had made good and eminent friends in that neighborhood, one being Thorbiorn, chief of Vifilsdale, son of Vifil, one of Queen Aud's Dublin men, of whom she had said that he would be distinguished anywhere, with land or without it. Also, Thorbiorn, through his beautiful daughter Gudrid, was to be grandfather to the first-born white American: so there were notable issues hanging on the door-posts of contention and on Eric's honest impulsiveness for good or ill. However, they overrode him and he was driven to hide in out-lying islands and inconvenient places, while his enemies hunted diligently to find and slay him.

Then our fugitive called to mind a ninety-year-old story of an unknown land over the western sea and determined to seek refuge

there. For one Gunnbiorn soon after the beginning of settlements in Iceland had found the rocky islets in the Greenland sea which long bore his name;¹ and had passed beyond them to full sight of a forbidding shore, on which he remained for a season. His account had not tempted any one thither in later years. That nameless region called for a man like Eric to open it, hardly for any other—a man homeless and endangered but inherently hopeful, at once astute and daring, and far from unbefriended.

Those who still stood by him helped Eric to a ship, which lay hidden in quiet places till he could slip away with a volunteer crew, quite suddenly, into the unknown.

For three years he was lost to the world,² three years devoted to an exploration so careful and thorough that, according to Rink's Danish Greenland (a "fascinating book" as Fiske has rightly called it) hardly anything has remained for later search unless in the absolutely ice-clad interior, the remote north or the nearly inaccessible east. Nansen also—and there can be no better authority—ranks his achievements as an explorer among the very greatest. Passing through the narrow water gates—hidden altogether from the eyes of Davis late in the sixteenth century—which break at intervals the Coast of Desolation, he followed deep and branching fiords into an interrupted belt of verdure and flowers, of low trees and shrubs and plentiful berries, of tumbling cascades and far off glacier-glimpses; and this he called Greenland, choosing it for the heart of his main settlement. Another area, somewhat like it, about two hundred and fifty miles up the shore, was penetrated and chosen, too, becoming the site of the lesser western settlement. The subsequent centuries have disclosed no improvement upon these, and he seems to have acquainted himself equally with the less valuable or utterly savage regions which he passed by. There is no doubt that he reached Davis Strait, very likely passing up beyond Disco, soon afterward well known as Bear Island (Biarney). He may well have stood out far enough from shore to see the other side. When the work was

¹For their disappearance see note on Ruysch's (1507) map of the world, Lelewel's Atlas. Also Voyages of the Cabots and Cortereals by H. P. Biggar, p. 60; also Major's Works; but Nansen dissents, believing they were on the Greenland coast.

²"This happened five hundred years before the rediscovery of America by Columbus and Cabot. I think this Norse exploration of Greenland a thousand years ago equals any modern polar exploration both as regards importance and as regards the way in which it was carried out." Nansen in Scribner's Mag., Mar. 1912. Article dated Nov. 26, 1911.

all done he brought back his astonishing report to the elder colony, calling for settlers to people this new Greenland. What he had found justified the name as to the region chiefly intended, but the native shrewdness and humor of the man come out in his announcement—presumably among friends—that by giving it a good name they would get settlers more easily.

All at once he had become a popular hero. The tidings went over Iceland, awakening an eager spirit of enterprise. Here was a new realm won for them by a man whom they had expelled. Outlawry was disregarded and died out, hardly needing a formal rescinding. One perfunctory duel for honor's sake ended the feud. We are told that Eric had the worst of it, and can see that he might feel able to afford such a settlement, having graver matters in hand. Perhaps he was beginning to feel the claims of a continent. Then a large fleet, for the time and country, set out under his leadership, losing eleven vessels by the way, although the major part won through and safely established themselves in their new home about the year 985. The center of this colony was at Eric's home, Brattahlid, near one of the branches of what is now known as Igalico inlet. Apparently he was the first judge as well as chief personage. Not far away, toward the other branch, the Cathedral of Gardar was built a hundred and forty years later. It still stands, though perhaps an early fifteenth century restoration, as the ruined "Kakortok church." In all that region Eskimo names have supplanted Norse, except a few added by Danes in the last two centuries. Yet from Greenland came the Lay of Atli and possibly Edda poems¹ and Dr. Nansen supposes that a special school of versification had its origin there.

No one who follows the career of Eric, as outlined by the often unsympathetic saga-men, will grudge him this hardly won triumph. Few characters, if any, are more clearly presented in history; few are stronger and more interesting. A sea-king who never marauded; a just man, careful of what was confided to him, yet insisting promptly on his rights at every cost; a conservative, who could turn explorer off hand with better results than the work of the very best; a deadly fighter who fought defensively only; a man of hospitality, cordiality, cheerfulness, who never complained except when his Christian wife turned against him for remaining a pagan.

He made the Norse Greenland, which stood as his monument for nearly five hundred years. He gave the name by which we know it

¹ G. Vigfusson: *Prolegomena to the Sturlunga Saga*, p. 191.

still. If Greenland be America, he was the first explorer of any part of America, so far as we know. He may have been the first white man to view the more immediate American shores. At any rate he gave to the world, and sent forth upon his ventures, the historic Leif who is first of record as making that discovery. He also aided in sending forth the expedition which bore Thorfinn Karlsefni and Gudrid to these shores, giving Gudrid in marriage from his house and seeing his son Thorvald sail off to death in their company.

6.—THE VOYAGES OF MADOC AND THE ZENO BROTHERS

A few early westward voyages on the Atlantic offer at first glance the hope of throwing light upon Wineland problems, but they really supply very little information. Nicholas of Lynn, whose work has been traced as far as possible by De Costa¹ and others, has left on various maps indications of theories derived from his northern explorations about the year 1360. He seems to have reached Iceland, making a quick passage and presumably going farther; but until his lost narrative "*Inventio Fortunata*" shall be found, who can tell where he went?

Madoc of Wales has been put forward intermittently for centuries with zeal as the first colonizer of America. Welsh Indians, by blood or language, were formerly (as was supposed) discovered by his advocates in Florida, Mexico, the Carolina mountains, the Hopi pueblos, and the Mandan villages on the Missouri. One man declared that he was greeted in Welsh in the lobby of a Washington hotel by an "Asquaw" chieftain of Virginia "wearing ostrich feathers."² Stephens's newly republished "*Madoc*" is a veritable museum of these futile oddities. There is no room for Welsh, recent or archaic, on our Indian linguistic map, and the world, has grown incredulous about it. Welsh people might, however, have come and lost their language; and they might blend with the red men so as to be indistinguishable in their descendants. We suppose such a result, or extermination, to have occurred in the case of Sir Walter Raleigh's colony,³ the Norse Greenlanders and the Spanish expedition, going eastward, which vanished in the Llano Estacado. We know it was so in the case of the Spanish Chilians, overwhelmed

¹ B. F. De Costa: *Arctic Exploration*. Amer. Geogr. Soc. Bull., 1880, p. 163.

² Th. Stephens: *Madoc* (ed. 1893).

³ W. Strachey: *The Historic of Travaile into Virginia*. (See Powhatan's statement.)

and absorbed by the Araucanians. And one of the wildest tribes of the Peruvian mountains is said to be quite certainly in part of European descent (which does not show at all) as a result of a lost white city planted unluckily by a viceroy to overawe them. However, we have no proof of such experience in the case of Madoc's followers.

Across the ocean there is some little evidence for him; but either late or uncertain. That part of the History of Cambria attributed to Caradog of Llancarvan (died 1152) mentions Madoc in its last paragraph among "Prince Owen Gwynedd's many children by divers women." Certain abbeys brought the work down to the year 1270. A well known English translation of about 1559 by Humphrey Lloyd was afterward edited and extended by D. Powell with great pains, and published in 1584. Both of these modern writers made interpolations, which there was an honest attempt to distinguish by notes and markings; but they leave the reader uncertain as to the actual facts.

Thus the statement that "Madoc left the land and prepared certain ships and men and munition and sought adventures by seas, sailing west, leaving the coast of Ireland so far north that he came to lands unknown," may be due to some forgotten brother of a monastery; or to Lloyd the translator nearly five centuries afterward, as the next sentences undoubtedly are.

Furthermore, when we find Powell quoting from Gutyn Owens, an early writer, to the effect that Madoc left some of his people in the new country when he returned to Wales and that he afterward sailed to rejoin them with ten ships, it is baffling to learn from Stephens that close inquiry fails to supply any original and that the passage is not in the manuscript work to which it most often has been credited. Yet assuming that Powell read it in some lost book of Owens, and even that it be true, we still are not informed where Madoc went.

Stephens also winnowed and sifted a number of pre-Columbian allusions or supposed allusions to Madoc in Welsh poems; giving more accurate translations, which offer such unnautical substitutes as "walls" and "fierceness" for the sea-words relied upon. There remains only a small residuum, vaguely celebrating his taste for navigation. We may add Lloyd's reference to certain popular "fables" of Madoc current in the sixteenth century, but a specimen would be more valuable than the translator's easy disparagement.

Davies, quoted and followed by Stephens,¹ believed that Madoc died in Wales by the hand of an assassin before the year 1170, the

¹ Th. Stephens: *Madoc* (ed. 1893), p. 212; see also p. 210.

date usually alleged for his voyage. This is fortified by an ancient quotation or so and by a reminder that Giraldus Cambrensis, who missed very little which seemed noteworthy, was in that neighborhood within 18 years afterward and tells us nothing about Madoc's voyage—a consideration which one may appreciate without any Welsh scholarship. Moreover, this same observant Gerald explicitly blames the Welsh for their lack of interest in shipping. They seem to have had little to do with the ocean since Arthur's time, as compared with the Irish and Bretons. However, the growth of a legend of American colonization from the assassination of a Welsh prince is not conclusively made out nor easily thinkable.

It seems more likely that he sailed, at first on a westward course as stated, which, if continued far enough, might land him in Nova Scotia or on the shore of the Gulf of St. Lawrence. But Madoc of Wales would have no compass, though the Arabs had it, and the Spaniards through them;¹ and though the troubadour Guiot de Provins was to mention it only four years later; and Madoc had no particular aim that we know of, so that, either by accident or design, his helm may have shifted widely. Armorica, Madeira, and other possible landfalls have been suggested; but there is no evidence for any of them.

If the story of Madoc is baffling through its meagerness approaching a vacuum, the Zeno Brothers' ² narrative is likewise baffling by its exuberance and confusion. Nicoló Zeno published the story at Venice in 1588, as his best restoration of a map and letters, which he had found when a boy among family documents and torn or otherwise damaged unthinkingly. His work seems mainly done in good faith and to celebrate the prowess of the earlier Zeni, with no thought of pitting them against Columbus; but he used divers maps and books to help him out and conjectured at random, and even wilfully decorated a little, as though to make amends for very spiteful usage.³ Thus "Icaria" in the original—possibly Kerry or St. Kilda—suggests the myth of Daedalus, which forthwith comes headlong into the story. Again he must needs help out a fisherman's yarn of travel among Indians in America by a little recently acquired knowledge of Aztec temples and human sacrifices. There was also a great shifting of harbors and towns. His most conspicuous invention

¹ Th. Stephens: *Madoc*, p. 195.

² R. H. Major: *The Voyages of the Venetian Brothers Zeno*.

³ F. W. Lucas: *The Annals of the Voyages of the Brothers Zeno* (1895), pp. 8, 83, 99.

is Frisland, a huge island south of Iceland, identified by Mr. Lucas¹ with the Resland of Edrisi—apparently Estland or Shetland (some say Iceland); though Mr. Major thought Frisland the Faroe-islands, blended by misunderstanding into one and shifted to unfrequented seas, where it might be credible (see note 7, p. 177). In fact it took root there, to the confusion of explorers and cartographers for several centuries. Sigurdr Stefánsson makes it a very little one on his map; which bears the apologetic note:

“I do not know what island this may be unless the one that the Venetian found.”

In getting back to the original communication, we are further baffled by its unintended ingenuity of misunderstanding, a habit of prodigious exaggeration and a genius for transforming words. When we read that Zichmi, ruling in Frisland, made war against the King of Norway, it means, according to Major, that Earl Sinclair of the Orkneys had a skirmish with a forgotten claimant to a part of his territory. Later, a warm spring on an island of a Greenland fiord, beside which a monastery once stood, evolves a monastery and monk-ruled village on an active volcanic mountain with commercially profitable gardening, carried on by the aid of hot water pipes—an item borrowed, according to Lucas, from sixteenth century Norway or Iceland. You soon can measure the value of such narrative and make due allowance for its exaggerations. There is usually some germ of truth to be found and the Greenland part of their map has an accuracy in detail which appears to mark it as based on personal observation or information (see Major) that Europe could not supply, although even this argument in favor of the story has been undermined by Lucas and the discovery of some ancient maps.

It seems that an earlier Nicoló Zeno, being cast by chance on the coast of Frisland about 1390, was saved from the rude inhabitants by Zichmi, lord of the region, who took the Italian into his service. Nicoló participated in the wars then and afterward carried on by the Earl, and sent for his brother Antonio, who joined him in Frisland, took part in the Shetland Campaign, and wrote letters to their brother Carlo at home. A certain Faroese fisherman having brought back after a long absence a tale of strange adventures in unknown countries southwest of Greenland, Zichmi fitted out an expedition to seek them. This expedition, however, found only “Icaria,” Iceland, and Greenland, with some minor islands known and unknown. The brothers Nicoló and Antonio accompanied Zichmi, perhaps about

¹ *Op. cit.*, p. 105.

1400, and wrote a narrative of this voyage, which was recast by the younger Nicoló. It gives our last glimpse of civilized life in Greenland, if accepted as veritable. The monastery by the hot spring and a curious description of kayaks as in use among the people, may be taken hesitatingly as credentials. Lucas hardly makes out a case against them. The warm Greenland ¹ spring thus utilized also occurs twice in Hans Egede's citations.

It would seem that the white and Eskimo races were then inter-changing arts, and perhaps the racial blending had begun. Similarly, there is mention elsewhere ² of a Norse visitor for two winters, beginning in 1385, who had two Eskimo servants. It was many years since Ivar Bardsen, then or afterward steward of the Bishop, accompanied, probably about 1337, an expedition of relief to the western settlement, threatened by the Eskimo—and found that colony devoid of human life. A few deserted cattle and nothing more remained as relics of the earliest of the Greenland mysteries. The preceding decade affords the curious evidence of an extant official receipt for the Greenland contribution of 1327 (in walrus tusks) to the expenses of a crusade.³ These facts and the 1347 voyage to Markland show that the Eastern settlement at least was alive and in touch with both continents. Through the second half of the fourteenth century we must suppose that the Eskimo were drawing nearer and gaining ground, especially after the return to Norway in or before 1364 of the relief expedition of 1355 under Paul Knutson.⁴ About 1379 there seems to have been another Eskimo attack, costing the colony 18 men. But probably peace reigned in 1400 and as late as 1409, when a young Icelander visiting Greenland was married at Gardar by the Bishop and even after 1410, when the last authentic voyage ⁵ from Iceland to Greenland occurred.

About 1418 the storm broke on them, according to a papal letter of 1448, in the form of a fleet of heathen, devastation, captivity, and death. But the destruction was not complete and in 1448 the colony was getting together again. A dubious entry ⁶ of 1484 mentions annual voyages until then from Bergen to Greenland. Another papal letter,⁷ about ten years afterward, announces the

¹ H. Egede: *A Description of Greenland*, pp. 20, 21.

² W. Thalbitzer: *The Eskimo Language*, p. 29.

³ H. J. Rink: *Danish Greenland*, ed. by R. Brown, p. 28.

⁴ G. Storm: *Studies on the Vineland Voyages*, 1899.

⁵ H. J. Rink: *Danish Greenland*, ed. by R. Brown p. 29.

⁶ W. Thalbitzer: *The Eskimo Language*, p. 29.

⁷ J. E. Olson: *The Voyages of the Norsemen*. Orig. Narr. Early Amer Hist., Vol. 1.

sailing of a new bishop, who never seems to have reached the colony or even Iceland. An effort was, however, made to reopen communications about 1492, but nothing came of it.¹ After that, there is nothing except the hints and rumors gathered by the loving care of Hans Egede,² while he was hoping against hope that some remnants might survive behind the ice-barrier of the eastern Greenland coast in deep fiords, which have since been explored by Lieutenant (later Commodore) Holm³ of the Danish navy and others, yielding nothing. Admittedly the most nearly authentic of these reports, as well as the most thrilling experience, was that of the sixteenth century Iceland Bishop, Amund of Skalholt, who was driven by rough weather so close to Heriulfsness that he heard, or thought he heard, the lost people driving home their cattle and sheep in the twilight.

Probably we shall never know just when the last flicker of civilized life died out of Norse Greenland; but it may well have been somewhere between the middle and the end of the fifteenth century. Darkness falls, and there is an end; but the uncertainty and the marked pathos of this chapter of old history makes any item very welcome, even if distorted (see note 8, p. 177).

Major's skill in clearing away the fogs from the adventures of the Zeni among the island clusters and in Greenland has naturally been less available for America. The fisherman who caused the memorable western expedition died before it started; but the regions called by them Estotiland and Drogeo appear on their map as roughly corresponding to Newfoundland and Nova Scotia. Kohl⁴ has suggested East-outland as a derivation of the name, with reference to the eastward protrusion of that great insular mass of land; but there seems a difficulty in accounting for the adoption of this English form. Lucas⁵ rather improbably derives Estotiland, by not very confident conjecture, from the beginning of an old motto. Beauvois⁶ has an interesting suggestion that Estotiland is a misreading of Escociland (Scotland), perhaps not clearly written in the original letter; the name having been transferred to America as Great Ireland had been long before, and as Nova Scotia and Cape Breton were also in later times. This seems probable.

¹ J. Fischer: *The Discoveries of the Northmen in America*, p. 51.

² H. Egede: *A Description of Greenland*, pp. 14-22.

³ G. Holm: *Explorations of the East Coast of Greenland*. *Meddelelser om Grönland*, vol. 9.

⁴ *The Discovery of Maine*, p. 105.

⁵ *Voyages of the Zeno Brothers*, before cited.

⁶ *La Découverte du Nouveau Monde par les Irlandais*, p. 90.

The informant averred that he had been driven thither by storms with the crew of a small fishing vessel; and was afterward sent with them southward by the chief of the country to a region called Drogeo or Drogio, on one map Droceo. Being captured by savages, he was transferred from tribe to tribe far southwestward, reaching a country of temples and sacrifices, until by good fortune he escaped and succeeded in making his way back to Estotiland (Escociland); thence crossing to Greenland and reaching home at last.

Drogio has also caused much speculation, the preferred theory being that it is native American more or less changed. But perhaps this name also had a European origin, Italian in source or transmission. On Mercator's map of 1595, we find the words *Drogio di Cornu Gallia* (compare Cornouailles of Brittany) applied to Cape Breton island; which is too far removed from the mainland, but unmistakable in its distinctive form.* There is no mistaking, either, his reference to the Breton horn protruding from northwestern France into the Atlantic, which gave its name, early in the sixteenth century, through its seafaring sons, to this other long, ^{elevated} northern cape or ness discovered in the new world. This was ^{always} the next land below Newfoundland; it was also lower in elevation, perhaps in part very much so, as fully half the island certainly is now. Possibly *deroga*, *derogare*, or *dirogare*, if carelessly treated, might evolve a Drogio fitting both meanings, if the Italian word may dispense with the moral implication of "derogatory." Mercator's identification, being but seven years later than the publication of the Zeno story, and, therefore, that of a geographer who could have consulted the publisher and author on any doubtful and important point, must be taken as more nearly authoritative than anything else which we have. Ortelius, about the same time, showed Drogio even farther from the mainland and with less fidelity to outline, but the intent is the same.

This seems a revulsion from the more frequent mapping of Cape Breton Island as integral with Nova Scotia, which was less literally true, yet nearer the actual fact; for the Gut of Canso has never been more than a water-thread, and there was nothing to prevent the continuous southwestern travel indicated by the story, with hardly appreciable addition of canoe-ferriage.

Dr. Fiske is at pains to present parallels to the tale of this castaway in the narratives of the romancing Ingram, and the more historic as well as more widely ranging Cabeza de Vaca. We might add Selim of Barbary, who appeared in colonial times on the wilderness border of Virginia, having been carried from New Orleans to the Shawnees

on the Ohio, and worked through the Indian country and the mountains, as related by Bishop Meade.¹ Nothing in the story of the Zeno-informant is more incredible than Ingram's² extravagances about the city of Norumbega, followed by other writers and perhaps developed from some real though temporary Penobscot Indian town. Yet the first part of the former offers us a civilized or nearly civilized Newfoundland nation, the middle is too general and easily invented to be quite convincing; and the southern part, nearer the end, is a meager and faint reflection of Spanish observations in Mexico.

Lucas, however, must be wrong in ascribing the whole story to the latter source, for the Estotiland and Drogio portions have no Spanish earmarks and are placed too far north. On the other hand, Kohl in the *Discovery of Maine* is equally inadequate, finding only, as he thinks, the reflection of the general American knowledge of Greenland Norsemen; for these could have had no such illusions about their neighbor, Markland, then known for several centuries; and, on the other hand, they may be supposed quite ignorant of semi-civilized teocallis, temples, and human sacrifices. About all that could be obtained in Greenland for this little Zeno exposition of fourteenth century America was the existence of a timbered Newfoundland, its protrusion into the ocean, the fact that it was inhabited, the great cape below it, the sea between and behind, some notion of a lower coast peopled by savages, and some lingering tradition of a warmer and more fertile region lower still, and effectively guarded in like manner.

A faint shadow of corroboration may be found in Cormack's³ account of the surprising works of industry of the Beothuk in 1828 and what Cartwright⁴ has to tell us more than half a century earlier. There was surely something of the Norse indomitableness about a people who, after centuries of encompassment and continual hostility, could still refuse submission or even amicable relations, choosing destruction instead, and who inspired a terror that outlived them in their Micmac enemies and successors. When we read of their thirty miles and more of deer-fences in use when they were confined to a small area in the northwest of the island; of their stone causeways,

¹ Wm. Meade: *The Old Churches, Ministers and Families of Virginia*. vol. 1, p. 34.

² M. Lescarbot: *Nova Francia*. Erondelle's transl., p. 47. Also Champlain's *Voyages*, p. 46. Orig. Narr. Early Amer. Hist.

³ W. E. Cormack: *Journey in Search of the Red Indians in Newfoundland*; Edinb. Philos. Journ., vol. 6, 1829, p. 327.

⁴ Capt. Cartwright and his *Journal*; republished 1911; before cited.

notable food-preserving inventions, and ingenuity in boat-building and husbanding their few resources, it seems possible enough that about the year 1380 there may have been some Newfoundland palisaded town, rather more advanced than the Hochelaga which Cartier found and which was soon obliterated.

But this Italian literary curiosity of the Zeni is not such a thread of evidence as will bear any serious strain.

7.—ARE THERE NORSE RELICS IN AMERICA?

If Icelanders or Greenlanders reached our Atlantic shore, there will always be a possibility that some trace of their former presence may be found. Whether it amounts to probability must depend on the extent and character of that presence. There is a vast difference between permanent occupancy¹ by thousands of people, erecting stone houses and bridges, churches, and monasteries, in a region like southern Greenland, where for centuries there were no other inhabitants and the forces of nature tended toward preservation, and the hasty visits of exploring parties and wood-cutters, or even brief attempts at colonizing a bit of forest country, subject to invasion by savages, fire, and decay.

Inscriptions deeply graven might last even until now in dry and protected places. But why should there be inscriptions? Laing reports in his preface to *Heimskringla* that "few if any runic inscriptions of a date prior to the introduction of Christianity are found in Iceland," while Greenland, though then already occupied for 15 years, and for centuries afterward, has not yielded one. There is not even a letter, runic or Latin, or a character of any kind, on the standing cathedral walls of Gardar or anywhere within its compass, though repeated excavations have exhausted all the ground. Graah² noticed a tablet-like wall-stone with parallel lines on its inner face, which may have been prepared for such use, but the purpose was never carried out. There are perhaps half a dozen Greenland gravestone inscriptions of the conventional sort, in one alphabet or the other, beginning with the twelfth century; and far up Baffin Bay a miniature monument was found about 1824, bearing the names of men who had "cleared land" or performed some other operation there at a date near Whitsuntide in the year 1135, as some read it, though others put the year a century or two later, apparently either as a preemption entry or a record of exploring achievement. Nothing more than this in the way

¹ H. J. Rink: *Danish Greenland*.

² W. A. Graah: *Narr. of an Expedition to the East Coast of Greenland*, p. 40.

of inscriptions from Greenland's estimated population of ten thousand (Dr. Rink) with an organized life exceeding in duration that of English-speaking America from the beginning until now! Brat-tahlid's doorway-lintel, perhaps of the year 995, still held its old position in the middle of the nineteenth century, but this mansion of Eric and the homes of his long dominant descendants have not favored us with one carven line or letter. Surely we must think that these people were not given to expressing themselves in that way.

But human opposition and eagerness were certain to discover supposed runes and confirmatory vestiges in America when attention was once directed to the subject. Rafn's voluminous *Antiquitates Americanæ* led the way with the Newport "tower" (since clearly shown to have been only Governor Arnold's windmill patterned on an older one in his former English home) and other equally random fancies. Longfellow embodied one of these speculations in a spirited ballad, immortalizing that squalid Fall River "skeleton in armor," whose copper breast-tablet and belt only antedated the ornaments found by Gosnold¹ in use on Cape Cod, with no hope at all of such honor.

The Dighton rock-pictures, with the central row of tallymarks, have been many times published since the first copying by Dr. Danforth in 1680. The present rate of obliteration would have wiped them quite away before now, if existing conditions had been established then or a little earlier.² Schoolcraft obtained an erudite Algonquian reading from his Ojibway experts, although the tally marks baffled them, and these he called runes, but afterward withdrew the exception. As quoted by Colonel Mallery,³ his final verdict was: "It is of purely Indian origin, and is executed in the peculiar symbolic character of the Keekeewin." These tally-like marks were still visible when I visited the rock in 1910, but might apparently have been made by any one who could carve the numeral 1 or an X.

On the west shore of Mt. Hope Bay, near that noted elevation, is a boulder marked on its top, as it now lies, with the outline of a boat, having the bow enlarged or uplifted, much as a white man's boat will appear when the stern sets low in the water. We saw several like instances on Taunton River soon after inspecting and tracing the one above mentioned. An Indian canoe hardly could be

¹ J. Brereton: *A Briefe Relation of the Discoverie by Gosnold*. Bibliographer, 1902, p. 33. Also in *Old South Leaflets*.

² See Prof. Greenwood's letter of 1730. *Amer. Anthropol.*, 1908, p. 251.

³ Fourth Ann. Rep. Bur. Amer. Ethnol. (1882-1883).

made to look like that. It is fairly drawn in Bacon's Narragansett Bay, Miller's Wampanoags of Rhode Island, and Higginson's Larger History of America; and a duplicate of a copy made by Mr. Bacon in 1900 shows the other characters as published; but some of them are gone from the stone and all the others have been damaged. Only the boat remains unhurt, though shallow. Early settlers are said to have been acquainted with this rock when it was in the field above the low cliff or bank, near the base of which it now lies. It was lost sight of about the middle of the nineteenth century, but afterward found again, having most likely slipped down into the reach of the tide. Prof. Diman, when an undergraduate, is said to have mentioned it in the "Bristol Phoenix" about 1846, between the time of its loss and its rediscovery. Its characters have a more alphabetic look than those of the Dighton rock and may mean either something or nothing. It must not be forgotten that Indians often depict objects on rocks in idleness, just as any of us may carve a bit of wood or scrawl careless figures and characters on a newspaper margin. Such work is sometimes done as an exhibition of skill before others; and characters not obviously pictorial may be conventionalized outlines or random grooves and scratches, not necessarily even records of any fact, still less symbolic. Of course it is not intended to deny that pictorial records, such as the "winter counts," have been made and preserved by Indians, nor that symbolic figures are used in the ritual of their priests; but there can be no doubt that the tendency to find something esoteric or at least very meaningful in every chance bit of native rock-scratching has been a delusion and a snare.

The proximity of the boulder to Mount Hope seems to mark this queer relic as almost certainly Wampanoag work; and the same may be said with less confidence of a chain of deeply incised recesses and channels in the landward face of another boulder found by Mr. David Hutcheson¹ just off shore at high tide (bare at low tide) in a small cove of Portsmouth Bay, Aquidneck, across the fields from the railway station. Several other inscriptions, plainly Indian work, are figured at the end of the *Antiquitates Americanæ* as formerly existent at this point and at Tiverton on the other side of the strait known as Sakonnet River. They seem to have since disappeared and call for no especial description.

No doubt the Wampanoags, Narragansets, or their more eastern neighbors of like stock, are responsible for the Dighton Rock cur-

¹ Charles Rau's monograph on cup stones illustrates Algonquian specimens of similarly connected pattern, the nearest being at Niantic in western Connecticut.

iosity-shop of figures, not necessarily the result of one hand or one period, but these are now fast lapsing into invisibility. There is something trivial and childish in most Indian pictorial work and this Taunton River contribution seems a rather aggravated case. It could emanate only from an infantile rudimentary people. To charge it or anything like it on those splendid Icelanders whose saga-literature remains a wonder of the world seems sufficiently absurd.

One objection, sometimes urged overhastily, requires, however, a little qualification. It has been said that no rock inscription or pictograph could last so long on our Atlantic coast. The present rate of wearing away by tide-water would ensure obliteration no doubt in much less than the nine hundred years between Thorfinn's time and our own, but that rate depends on present conditions, which did not obtain when the pictographs were out of reach of the tide, as they must have been at first and long afterward. This, of course, does not establish nine hundred years of life for them, but only that nine hundred years of life may not be impossible. In 1700, though then partly tide-washed, they were still "deeply engraved" according to Cotton Mather.¹

On Cape Cod, not far away, some forgotten hearthstones have been dug up as Norse witnesses; likewise a copper plate averred by E. N. Horsford² to bear "the legend of Kialarness." They have been almost restored to oblivion. The same must be said of like unconvincing evidences occasionally reported from various points around that bay.

The Charles River Valley near Boston is a region more zealously championed; especially in the Norumbega pamphlets of E. N. Horsford,³ whose tablet on his pretty "Tower of Norumbega" near Roberts station may be styled a new birth of history as the facts ought to have been. But such matters can hardly be settled in that way. We are given positively the dimensions and industries of Wineland as a nation, the name and site of its capital city, the exact part taken by the several leading explorers and founders, and a variety of miscellaneous information, eminently desirable if true, and at all events entertaining. In tracing the sources of the various items it is regretted that this learned and estimable investigator was not more thorough in securing basic knowledge for his conclusions.

¹Quoted in E. M. Bacon's "Narragansett Bay".

²E. N. Horsford: *The Landfall of Leif*, p. 31.

³The Defences of Norumbega, *The Landfall of Leif*, *The Discovery of the Ancient City*, *The Problem of the Northmen*, etc.

The "defences of Norumbega" about the base of this "tower" resolve themselves into a few roughly aligned rocks and a lower dyke of rifle-pit pattern following the curve of the hill, wherein a few dozen Indians or as many English colonists might have held off an enemy behind palisades. That they could have anything to do with the "city" and "quays" six miles below them is by no means clear. They seem a curiously futile protection, the place being accessible on so many other sides. Why must an enemy be supposed to follow the river? And why should the little fort be situated so far from base?

At Watertown (the Norumbega of Horsford) there are indeed the disordered stones of what may have been an effective rough dam before the present wooden one was constructed. The shores also exhibit embankments of sand, in which Horsford thought he discerned wharves, quays, and divers other appurtenances of a commercial waterside. One may safely say that they are man-made and not recent, but beyond this there is no safe road. The dam, according to the investigator, was to facilitate the floating of mausur wood for collection and export. Searching farther, he thought he found like vestiges in the Merrimack and other rivers of eastern Massachusetts; whence he inferred a thriving industry and a large Norse population, widely spread. It cannot be pretended that he has adequately accounted for its disappearance, with the whole inevitable retinue of domestic animals. This and like facts might surely have been given a better explanation, easy to find; for the Indians themselves were accustomed to dam and dyke streams, often of considerable size, as a part of their wier-construction, which was an important matter with them, since fisheries, especially in spring, were their most reliable source of abundant food supply along the Atlantic. It is of record that the Indians taught somewhat of that art to the early Virginian colonists, and their skill and industry in this line excited surprise. The few surviving Nanticoke of Delaware, in fact, have told me that an old dam and a ruined fish-trap of their ancestors yet remain visible on Indian River, and I have been shown a mound (as of the same origin) which would compare favorably for size with those I have inspected in Minnesota. The New England dams discovered by Prof. Horsford were probably also Algonquian and for fishing purposes, with no implication of white visitors or early lumbering. It is not very remarkable that their remains should be found above Boston on the Charles River as well as below Lewes, near Rehoboth Bay.

¹ Horsford: *The Defences of Norumbega*, pp. 10, 31.

Other structure-relics of the Charles River neighborhood, confidently identified by Horsford as marking the house-sites of Leif and Thorfinn, "a Norse path,"¹ duly photographed and published, and some stone walls and foundations credited with unfamiliar character are at least white man's work. An attempt has been made by the Horsfords and some of their adherents to fasten these works on Norse white men, through a series of excavations on abandoned Icelandic homesites made by a Scandinavian scholar (which are in themselves very interesting), but nothing has been established in that way affecting the question. Many simple homes have been erected, abandoned, and forgotten in all the older parts of our country, for Anglo-Saxon America is no longer new; and such remains do not usually differ decisively among related peoples.

The very land where this is written (in the hill country above the city of Washington) bears such traces of the past in different places and of different periods. It would be almost as easy to work out a more southern Leif's-booth and Norumbega above the Potomac wild rice and amid plentiful wild grape-vines, in accord with a "runestone"² found at the Great Falls ten or twelve miles up stream, if we may believe a sensational announcement in a newspaper of Washington city (1867). It was no doubt a wild fiction, but honored by a serious Danish refutation and a note by Dr. De Costa, correcting some errors and substituting others.

Finally, the Superintendent of the U. S. Coast and Geodetic Survey writes that the oldest chart of Boston Harbor accessible to him, made for the British government in the latter part of the eighteenth century, shows in the channel leading to the Back Bay a ruling depth of two fathoms. The flats of that bay have no depth-figures, but were not necessarily quite bare at low tide, for those of Dorchester similarly shown have a four-foot depth marked on them. He infers that there could have been only a "few feet" of depth on the Back Bay flats except when the tide came in. By "few" we must understand no doubt something like the four feet of Dorchester flats. It would have required a light draft "fleet" to make itself comfortable there in General Washington's time. At the date of Champlain's voyage (1660)³ there was naturally no bay worth considering. He explored the neighborhood and almost certainly anchored in Boston

¹ Horsford: *The Landfall of Leif* (frontispiece). Also Cornelia Horsford: *Vinland and Its Ruins*. (Appendix by Gudmundson and Erlendson.)

² F. Boggild: *Runic Inscription at the Great Falls of the Potomac*. *Historical Magazine*, March 1869.

³ *Voyages of Champlain*. *Original Narratives of Early American History*. p. 67.

Harbor before passing on to Plymouth. Charles River impressed him, for he called it "very broad," named it ineffectually the River du Guast and speculated as to whether it rose toward the "Iroquois," but with all his eagerness as an observer and pains as a recorder he has left us no sort of indication of the existence of any Back Bay. What then could there have been for Verrazano in 1523, much less for Thorfinn five hundred years earlier, in view of the fact that this part of the coast has been sinking for many centuries?

The unknown graves of Thorbrand and Thorvald, abandoned in a wild land, must always be themes of poetic interest—"the graves that the thicket covers, the graves that the rain bedews." Miss Horsford¹ hoped she had found the former, and if this indeed were only so!

A seaboard point near Ipswich has some stonework locally attributed to Norseman as Dr. Fewkes informs me.

A more positive claim has been put forward by a New Hampshire judge in the latter case, in the Boston Journal, quoted by the Philadelphia Times of July 27, 1902, as follows:

A certain field on the narrow marsh and beach on the main road up town [Hampton] contains the rock on which are cut the three crosses designating the grave where was buried Thorvald Ericsson 1004. The rock is a large granite stone lying in the earth, its face near the top of the ground with the crosses cut thereon and other marks cut by the hand of man with a stone chisel and not by any owner. That field came into possession of the author's ancestors 250 years ago.

Even so, there are 650 earlier years to be accounted for, years of absolute Indian dominance; and who so likely as an Indian to use a stone tool in such graving? The cross, too, has been a favorite symbol of all primitive religions from time immemorial. But, if we must give it a Christian significance, how many different kinds of Latin Catholics ranged this shore before and after the very numerous early sixteenth century Basque, and Breton fishermen! There were the expeditions of Gomez, Fagundes, and Verrazano, the Spanish searchers after the lost De Soto, the colonizing De Monts and Champlain, Jesuit priests with their dusky flocks raiding or exploring, adventurous noblemen lapsing out of French civilization after the fashion of the Baron of Castine! The list might be increased and the marking of a cross would be almost automatic on the part of any of these gentry. So the judge's assurance, giving it full face value, does not seem to take us very far toward certainty about the interment of Thorvald son of Eric so many centuries before.

¹ Cornelia Horsford: *The Graves of the Norsemen*, pp. 20, 40. (Bound with Leif's House in Vinland.)

On the Maine sea-coast even the kitchen-midden-like oyster-shell-heaps are turned to account as Norse vestiges. "There are three distinct strata," the lowest representing cannibalistic savagery, the second, ordinary Indian occupancy. A railway folder says of the highest: "Prof. Putnam claims this to be of Norse origin"; but it also says that the Norse colonies in Greenland "about the 8th century supported 20 bishops" and that "the Phenicians are the legendary ancestors of these Irish Druids." Rock inscriptions on Monhegan Island and elsewhere are attributed to Phenicians or Norsemen, according to taste and individual sense of probability. The Monhegan inscription,¹ discovered in the fifties of the nineteenth century, has been "interpreted" as giving the age of a certain chieftain, and one Canadian theorist even identified it as the work of Turanians not long over from Japan, who left similar messages in Michigan on the way. A "rune-stone" has also been found at Ellsworth and a double-edged dagger, "the exact likeness of one in Du Chaillu's Viking Age," in a cellar near Castine. Pemaquid² discloses pavements and house foundations, and similar vestiges as well as Algonquian inscriptions are scattered up and down the coast and along the rivers. They may be mysterious enough to be Icelandic, but no positive proof takes any of these relics back of the early Breton visitors or the first French and English attempts at colonization.

In the Algonquian myths of Maine and the British provinces, Leland³ believes that he distinguishes echoes of the Eddas, proving Norse intercourse, but these do not impress every ear. Moreover Leif came as a missionary royally commissioned to spread the Christian faith; and Thorfinn and Gudrid, with most of their followers, were in the first flush of conversion. After her return to Iceland Gudrid was considered nearly as a saint. Besides, these stories have a distinctly aboriginal air. One really cannot discern the contrast which Leland insists on between their quality and construction and those of the Iroquois and Ojibway wonder tales. Of course there are some plots and mythical explanations which grow the world over out of certain human complications or insistent natural phenomena. It is not surprising that a Passamaquoddy Indian and an early Norseman should hit on similar impersonations of cold and

¹ Said to be copied in *Mémoires de la Société Royale des Antiquaires du Nord*, May 14 1859.

² J. H. Cartland: *Ten Years at Pemaquid*, pp. 94-103.

³ C. G. Leland: *The Algonquin Legends of New England*; also his *The Edda Among the Algonquin Indians*. *Atlas* tonthly, Aug. 1889, p. 223.

hunger, of storm and electrical discharges, or weave simple dramas of war and home life in more or less likeness to each other. The chain of such evidence is not strong enough to hold.

Lacrosse, the national game of Canada, has also been claimed by Hertzberg and Nansen¹ as a Scandinavian contribution, but Mooney, who is better authority as to aboriginal idiosyncracies and probabilities, tells me that it is distinctively Indian. Nor can one easily believe in such an acquisition reaching the southern tribes so quickly in the conditions then probably prevailing. The Eskimo game reported by Egede seems a strained parallel and a poor partial coincidence. Giving the Norwegian game the benefit of all doubt as to substantial identity with lacrosse, we must not forget how cat's-cradle, that very artificial sport of ingenuity, occurs from of old in Britain and Polynesia (see Porter's Journal) and how even the most surprising expedients and preposterous customs have apparently been reinvented repeatedly in remote parts of the world.

One would be inclined to consider more seriously the double-headed axe and the gouge, both peculiar to Scandinavia and north-eastern America, which were exhibited by Holmes, December 27, 1911, before the American Association for the Advancement of Science, but it may be best to imitate his caution in drawing no inferences. Such topics tempt the fancy and their accumulation cannot quite fail to leave some impress. But they prove nothing.

Next beyond the State of Maine, and at the entrance to the broadspread, lovely Passamaquoddy or St. Croix Bay, lies Grand Manan, theoretically one of the most hopeful, or least hopeless, fields for research, spreading obliquely north-northeast and south-southwest in the mouth of the great Bay of Fundy. Thus far, no trace of anything earlier than the American Revolution (and not unmistakably Indian) seems to have been found on that island, unless it be an anchor greatly reduced by long rust and ocean wear, and attributed by some to Champlain, though without any obvious reason. Doubtless many other Frenchmen anchored there in olden times, and Mr. McIntosh of the Natural History Museum at St. John, New Brunswick, assures me that French anchors are often found in various parts of the province. Since nothing that can be identified remains of Champlain on or near Grand Manan, it is the less remarkable that we should find no trace of Thorfinn's party, who landed, if at all, 600 years earlier. Such traces may, however, be hidden there, for the northwestern side of the island presents at least 20 miles of wilder-

¹ The Norsemen in America. *Geogr. Journ.*, vol. 38, p. 574; also *In Northern Mists*, vol. 2, pp. 38-41.

ness, behind precipices, towering several hundred feet above the sea, and its thorough archeological exploration is an affair of the future.

On the mainland of New Brunswick a curious medallion-like stone has been found near the road between St. Andrews and St. John, below a cliff of similar material and beside Lake Utopia, a near neighbor of the Passamaquoddy region. Its dimensions are considerable, nearly two feet by more than a foot and a half, and it bears a profile face, head, and neck in outline, shown in a drawing accompanying a paper by J. Allen Jack.¹ He believed it to be Indian; but Mr. McIntosh thinks not. It seems to be something of a mystery, although no one has ascribed it to the Norsemen.

Over the Bay of Fundy, at Yarmouth, Nova Scotia, are two rocks with strange markings; one of these "inscriptions" being sometimes translated "Harko's son addressed the men," though this is also credited to Nature's handiwork. I must agree with the Harko party to the extent of counter-scepticism concerning the probability of long mistaking rock-veins and the like for human letters. In that region they do sometimes simulate character outlines and graven symbols in a curious way, nevertheless almost anyone would distinguish the truth at a second glance, if not straining for an argument. But why should sensible Norsemen take so much pains to record such a trivial incident? More likely it is the work of Micmac Indians, or someone else equally removed from the Icelanders. Certainly it has not been accepted by most investigators. There are Micmac rock-pictures not far away at Fairy Lake. Also there are living Micmac above Digby, nearer still.

Rumors of the Norsemen linger about the Nova Scotia seaboard. Of one isle we are quaintly told by a guide-book that Red Eric loved to make it his special haunt—notwithstanding the plain testimony of the saga that he was crippled by an accident in attempting to embark with Thorstein, and took this for a warning to explore no farther, so remained quietly in Greenland during the Wineland voyages. There seems to be nothing tangible connecting any Norsemen with the spot, which may not have been above water in their time.

Newfoundland and the Gulf of St. Lawrence coast, though really promising on general principles, have yielded, I believe, only some early Basque and English foundations and relics, no longer claimed as Norse by anyone. Just below, southwestward at Miramichi on the

¹J. Allen Jack: *A Sculptured Stone Found in St. George, New Brunswick*. Smithsonian Rep., 1881, p. 665.

shore of the mild Acadian Bay, a few slippery coincidences in names, customs, etc., evidence to which ethnologists now attach little value, have been gathered by Bishop Howley¹ and put forward with a certain confidence in his *Vinland Vindicated*.

Labrador needs thorough searching. So far, it offers only certain small stone structures,² perhaps of native origin, and an Eskimo legend, quoted by Packard³ from an earlier writer, concerning a race of invulnerable giants, roundly identified with mail-clad Norseman by these white recorders. But Chambers, finding the same myth among the Iroquois, fastens it in *The Maid at Arms* on wandering Spaniards of De Soto's time. Yet further, we learn that other tribes know these tall, hard-shelled warriors in quarters beyond the reach of mailed Europeans. Perhaps the Norse Giants should be set aside for the present as fancy-figures; it is so natural for primitive ill-defended people to thrill over such nightmares, which may issue out of the dark at any moment and do what they will with you, themselves unharmed. Something of it, indeed, is in or behind every well created ghost-story.

The deep indentation of Hudson Bay offers perhaps the only remaining field—hardly a hopeful one. The Kensington rune stone⁴ fills it, having a legend all its own, and is now urged with determination by certain Minnesota advocates, geographical and linguistic, who certainly claim consideration. This relic was found in the interior of Minnesota by a Swedish farmer in a Swedish settlement, and it seems to be admitted that the inscription itself has a Swedish cast. These facts, added to the remoteness of the location and the obstacles in the way, surely raise a presumption against it. There is an attempt to overcome this objection by the statement that the stone was under and among the roots of a tree, estimated by observers to be forty years old, which would carry it well beyond the period of the modern Swedes in that locality. But any rapidly-growing tree, such as our tulip tree, or most other indigenous "poplars," will make a greater growth than Mr. Holand's several statements call for in much less time than that. A tulip tree near my home which had not yet sprung up from the seed, in August, 1897, showed in September, 1910, thirty-eight inches of measured circum-

¹M. F. Howley: *Vinland Vindicated*. Trans. Royal Soc. Can., 1898; see also E. Beauvois: *Les Dernières Vestiges du Christianisme*.

²W. G. Gosling: *Labrador*, chap. I, 1910.

³Alpheus S. Packard: *The Labrador Coast*, p. 220.

⁴H. R. Holand: *The Kensington Rune Stone*. Records of the Past, Jan.-Feb. 1910.

ference three feet above the ground. The story told by the inscription is improbable nearly to the point of impossibility. The runes are discredited by the verdicts of Messrs Dieserud and Flom and other competent philologists. The well-known but quite unauthentic map of J. Toulmin Smith, which took Thorfinn by sheer guesswork to Baffin Land before his departure southward, is offered us again as a background for the later travels of the alleged Minnesota explorers by the Hudson Bay route. Biørnsland parades there below Hvítarmannaland, Gudleif's course to and from it being traced as conscientiously as though something could be known, or reasonably conjectured, about it or him. And little but darkening of counsel can come from such a suggestion as that the forestland may be northward of the region of stony desolation. We find no sound reason for supposing that any Norsemen ever were in the neighborhood where the stone was found before the nineteenth century.

It seems, then, that so far as investigation has gone, there is not a single known record or relic of Wineland, Markland, Helluland, or any Norse or Icelandic voyage of discovery, extant at this time on American soil, which may be relied on with any confidence. There are inscriptions, but apparently Indians made them all except the freakish work of white men in our own time; there are games, traditional stories, musical compositions, weapons, utensils, remnants of rude architecture, and residua of past engineering work, but no link necessarily connects them with the period of Icelandic exploration or with the Norse race. One and all they may perfectly well be of some other origin—Indian, Basque, Breton, Norman, Dutch, Portuguese, French, Spanish, or English. Too many natives were on the ground, and too many different European peoples, who were not Scandinavians, came here between 1497 and 1620 for us to accept anything as belonging to or left by a Norse Wineland, without unimpeachable proof.

8.—CERTAIN COLLATERAL ITEMS OF EVIDENCE

Greenland and Wineland were coupled together from the beginning in popular mention. Thus we have seen Ari the Wise, between the years 1100 and 1114, referring to the hypothetical natives of the former and the well known natives of the latter in one sentence. About 1400 Ordericus Vitalis referred to "Finland" with Greenland, apparently meaning Vinland or Wineland, since he does not seem to have had the Baltic Finland in mind. Between these, in 1121, according to Icelandic annals, Eric Gnupson, then Bishop of Green-

land, sailed from that country to seek Wineland, and vanished utterly. At least there is no later mention of him, and two years afterward his flock, who should know best, are found demanding a new shepherd. The latter was accordingly consecrated (in 1124) in the person of Bishop Arnold. Bishop Eric remains a lost heroic figure of history. It is true that the Danish poet Lyschander of 1608, and Professor Horsford in 1889, agree concerning his later prosperity in the isolated Wineland diocese; but we do not know of anything behind their assertions more substantial than a cheery hopefulness. Most writers have supposed with Dr. Storm that he was on a missionary errand (though Dr. Nansen doubts this also), and that he died in trying to make the latter part of his title represent something real. However, nothing is positively known, except his passage from Iceland to Greenland in 1112, followed by his attempt, nine years later, to reach Wineland also.

Whosoever will is of course at liberty to believe that "Eric Gnupson" was really the "first bishop" of Wineland, or with the poet that:

Eric of Greenland did the deed;
He carried to Wineland both folk and creed;
Which are there e'en now surviving.

We see, full fledged, in these verses of the early seventeenth century the conception of a settled, organized, self-supporting Wineland, a thriving offshoot, which was to Greenland what we know Greenland to have been to Iceland or Iceland to Norway. The picture has its fascinations and seems to dominate many minds even yet. Nothing but proof is lacking, or at least some little glimmer of evidence in its favor. The real Wineland was a wild land, visited once by accident for a few weeks only; and once more intentionally, not long afterward, with three years' exploration and temporary abode at two points, by a party of colonists who abandoned the attempt and returned to Greenland and Iceland. That is all that we find positively recorded until 1347. This distinction, if clearly grasped, would have saved some misunderstanding and wasted work.

We have shown already that circumstances about the year 1000 favored and almost ensured the discovery of America from Greenland; also that the house of Eric Raudi would naturally take a leading part in the work. There is evidence that this happened; but as in most matters of remote history, the evidence is not absolutely first-hand. We must be content with copies of copies. The world, with due caution and corrections, rightly accepts and believes many things

without that special kind of proof required by the technical restrictions and arbitrary rules of convenience of English-speaking courts.

Apart from the chief narratives—the Hauksbook Saga of Thorfinn Karlsefni, the closely parallel Saga of Eric the Red, and the two chapters relating to Greenland and Wineland in the Flateybook Saga of Olaf Tryggvason—there are divers brief statements of very old writers, which corroborate and check them.

Our first witness is the prebendary, Adam of Bremen, not a Scandinavian but a well known German geographical author and official clergyman, who visited the court of Denmark about 1069, when he might still converse there with men who had met Leif or Thorfinn or some of their following and heard the story from their own lips. His “Description of the Northern Islands” was probably completed in Latin in 1076, undoubtedly not much later. In the sixteenth century there were at least six manuscript copies extant,¹ one or more being probably in southern Germany. Two such copies, written out in the thirteenth century, are now in Copenhagen and Vienna. The book was first published in print in 1585. Its authenticity is undoubted.

Reporting a conversation with the Danish King, it says:

Moreover he spoke of an island in that ocean, which is called Wineland, for the reason that vines grow wild there, which yield the best of wine. Moreover, that grain unsown grows there abundantly is not a fabulous fancy, but from the accounts of the Danes we know it to be a fact.²

Then he proceeds to tell of the “insupportable ice,” and gloom of uninhabitable regions beyond, ending the passage with a moving discourse on the perils of the northern seas. Here we seem to have some tradition of Helluland with its savage surroundings.

The name Wineland is superfluous to identify the more southern and more favored region, in view of the wild grain which is mentioned, and the wild grapes capable of making good wine. The valuable monograph of Dr. Jenks³ on The Wild Rice Gatherers of the Northwest plainly discloses what a staff of life the *Zizania* still is to thousands of Indians. Many of the slow rivers of our Atlantic slope abound in it no less than the smaller glacial lakes. As to the wild vintage grapes, Lescarbot⁴ who was of those next making their acquaintance along this shore, vaunts wine as God’s best gift to men,

¹ G. Storm: Studies on the Vineland Voyages. *Mémoires Société Royale des Antiquaires du Nord*, 1888; also separate 1889.

² Translation in Reeves’s “The Finding of Wineland the Good,” chap. 6, p. 92.

³ Ninth Ann. Rep. Bureau Amer. Ethnol., p. 1018.

⁴ Nova Francia. Erondelle’s transl., p. 97.

excepting only bread. Those large grapes are here yet and still wild, ranging above the middle of New England along the coast; their abundance then is plentifully attested and beyond all doubting.

Quite recently we have been invited to find a sufficient explanation of Adam's words in his credulity which resembled that of many other old writers, in the possibility that he might have read or heard of a statement by Isidore¹ of Seville attributing wild grapes, *messis* (perhaps grain) and vegetables to the ridges of the Canaries; in the fact that some ancient Irish sea-stories mention grape islands—as well as apple islands and other delectable places—and that he might have heard of them; and in the etymological, mythical, and every way mysterious relation of the unusual verbal form which we translate Wineland the Good (perhaps more adequately the Blessed) to the Isles of the Blest, the Fortunate Isles, the Irish Isles of the Undying and the fairy isles and hills of Scandinavia. But as Adam of Bremen adds no word, magical or otherwise, to plain Wineland—nor, for that matter, is any word added by the saga—we need not linger over the final point.

But is it not curious that Adam himself gives us no hint of these classical, Irish, and north European sources; that the next European visitors, Verrazano and Cartier, Strachey and Brereton, Champlain and Lescarbot, are equally reticent in this regard, and equally positive about the grapes; that the European writers who followed Adam of Bremen used his material freely but abstained from this particular statement as though to save their credit. Fearing this, he had taken pains to protest in advance that it was "not a fabulous fancy"; but the asseveration evidently was distrusted.

It may be objected that the sixteenth and seventeenth century Europeans had nothing to say about the wild grain, but Cartier's² "wild grain like rye" on the southern shore of the Gulf of St. Lawrence can be nothing but wild rice plainly distinguished as it is by him from the cultivated maize which he met soon afterward as an article of diet and called "millet as large as peas," even after he had seen it growing at Hochelaga. Neither he nor any other European would consider the wild rice after making the acquaintance of this greater cultivated Indian corn, which had nearly eclipsed its rival even among the natives. But in its absence the former was highly important to all. In our present corn belt, even wheat holds its ground beside maize almost wholly by alternation; but there

¹ Nansen: In Northern Mists, vol. I, p. 345, and other passages.

² The Voyages of Cartier. Orig. Narr. Early Amer. Hist.

could be no alternation between maize and wild rice, for they require different conditions of moisture. So the latter had become only an occasional variation of diet in Virginia, as Strachey seems to say, perhaps not being used at all farther northward; and the maize fields flourished. The French and English explorers gave prompt heed to them, and the first settlers who followed were kept alive by their yield. At an earlier time, the wild rice-patches would have been their only reliance—an effectual one if the crop were rightly watched and harvested.

But this would be a more impressive gift of nature to Icelanders; who brought no grain with them, raised none at home, and rarely before had enjoyed the prospect of bread for their tables; yet who knew both wheat and grapes well enough from their trading voyages to Ireland, England, and France, and from other experiences abroad. It is incredible that Leif or Thorfinn should need any explanation of the ordinary kinds of grain or of wine.

Adam names no Wineland explorers; perhaps he did not hear of them nor care for them. To him they would be only obscure citizens of a rude northern republic; and his chief informant, King Sweyn, may not have felt any greater concern in the matter, though it would appear that some of his own subjects were thought to have visited the new region.

With Ari Frode (the Wise), next in order, the case was radically different. Names and historic items, exactly given, were of prime importance to this every way remarkable man. He had set himself to tell in detail the story of the beginnings of Iceland, omitting nothing important which concerned any notable family of any neighborhood; a great national service never before undertaken anywhere; and he carried it through admirably. It is hardly exaggeration to call him the father of conscientious modern history. At least he began about 1100 the glorious prose literature of Iceland by a succession of investigations and records which the world has found invaluable. Born in 1067 and dying in 1148, he filled a long life with this excellent work.

It was his habit to learn, when he could, from the very men who had taken part in the events related, or, this being impossible, from those who had heard the story in that way, or to use the next best authority that was attainable. Thorkel Gellisson, his uncle, is thus quoted by him as having contributed certain Greenland items, derived at first hand from one of the companions of Eric the Red. Other informants were the foster son of Hall of the Side¹ and the

¹ G. Vigfusson: *Prolegomena of Sturlunga Saga*, p. 28.

daughter of Snorri the Priest, two leading early Icelandic chieftains. Vigfusson mentions six others in his masterly preface to the *Sturlunga Saga*. With this tendency and his opportunities it is nearly certain that Ari the Wise often heard the Wineland narrative in all its forms from the descendants of Gudrid, for example Bishop Thorlac Runolfsson, whom he undoubtedly knew.

There is no question that Ari wrote the *Islendingabók*, which survives in a later abridged version or *Libellus* also by his hand. The *Landnamabók* is probably in great part his too, excepting the entries of the eastern settlements and certain later additions, carrying the story down beyond his time, though his share in it has been double. He perhaps also began the long series of historic sagas¹ as one of the authors of the *Kristni-Saga* and the *Konungabók*, narrating respectively the conversion of the island and the deeds of Norwegian kings.

In each of these four books Wineland is mentioned; always as though readers would naturally be familiar with this item of history and geography. Once, being better known, it defines the supposed location of Great Ireland; and again, by a rather loose analogy, contributes its *Skraelings* to identify the as yet unseen inhabitants of Greenland, who had left some savage debris behind them—broken boats, discarded tools, and empty hovels. The *Landnamabók* has also a brief reference to “Karlsefni who found Wineland the Good, Snorri’s father”—every one plainly being supposed to know all about these personages.

The *Kristni-Saga* says of King Olaf Trygvason:

He sent Leif to Greenland to proclaim the faith there. On his voyage Leif found Wineland the Good; he also found men on a wreck at sea, therefore he was called Leif the Lucky.

The *Konungabók* passage is similar:

Leif, a son of Eric the Red, passed the same winter in good repute with King Olaf and accepted Christianity. And that summer, when Gizur went to Iceland, King Olaf sent Leif to Greenland, to proclaim Christianity there. He sailed that summer to Greenland. He found men on a wreck at sea and succoured them. Then also he found Wineland the Good and arrived at Greenland in the autumn. He took with him thither a priest and other spiritual teachers and went to Brattahlid to make his home with his father Eric. People afterward called him Leif the Lucky. But his father Eric said that one account should balance the other, that Leif had rescued the ship’s crew and this that he had brought the trickster to Greenland. This was the priest.

The vellum copy of this book, known as *Frisbók*, may be, according to Mr. Reeves, the oldest extant manuscript mentioning Wineland.

¹ Vigfusson and Powell: *Origines Islandicæ*.

There are references to the region and events which happened there in other ancient narratives which have never been even partly ascribed to Ari. Thus, to much the same effect, proceeds "The Longer Saga of Olaf Tryggvason," which, by the way, is not the one in the Flateybook:

King Olaf then sent Leif to Greenland to proclaim Christianity there. The King sent a priest and other holy men with him to baptize the people and to instruct them in the true faith. Leif sailed to Greenland that summer and rescued at sea the men of a ship's crew who were in great peril and lay upon the shattered wreckage of a ship; and on the same voyage he found Wineland the Good and at the end of the summer arrived in Greenland.

This passage ends like that of the *Konungabók*.

Also the very old *Eyrbyggja Saga*, two vellum pages of which date from 1300 and one entire copy from about 1350, relates that:

Snorri and Thorleif Kimbi went to Greenland. . . . Thorleif Kimbi lived in Greenland to old age. But Snorri went to Wineland the Good with Karlsefni; and when they were fighting with the Skrellings there in Wineland, Thorbrand Snorrason, a most valiant man, was slain.¹

This Snorri, the father of Thorbrand, is of course not to be confused with Snorri the little Winelander, son of Thorfinn Karlsefni and Gudrid, Thorbiorn's daughter.

Dr. Nansen calls attention to a narrative in the Longer Saga of King Olaf the Saint in which the latter is made to speak of Leif Ericsson without calling him Lucky or mentioning his discovery.

Besides narratives, there are divers geographical notices, following an old formula with modifications. Reeves and Rafn have quoted them in their works above mentioned. All agree as to the relative positions of Helluland, Markland, and Wineland along the American coast. One already quoted from the *Antiquitates Americanæ* (A. M. Codex 770), omits the name Helluland, but makes the meaning sufficiently clear by the substitution "deserts, uninhabited places and icebergs," indicated as "south from Greenland which is inhabited."

Always this series of regions is located "south from Greenland." Usually they are identified as belonging to Europe. In two or three instances an extension of the formula occurs, suggesting the connection of Wineland to Africa, with inevitable implication of heat and luxuriance. In "The Finding of Wineland the Good" Mr. Reeves takes some pains to array these instances. Probably they represent the usual teaching of the northern schools during several centuries.

His most significant quotation is from the Arne Magnean MS. 194 (8 vo.), a miscellany partly in Latin, partly in Icelandic:

¹ A. M. Reeves: *The Finding of Wineland the Good*, p. 18.

Southward from Greenland is Helluland, then comes Markland; thence it is not far to Wineland the Good, which some men believe extends from Africa, and, if this be so, then there is an open sea flowing in between Wineland and Markland. It is said, that Thorfinn Karlsefni hewed a "house-neat-timber" and then went to seek Wineland the Good, and came to where they believed this land to be, but they did not succeed in exploring it, or in obtaining any of its products. Leif the Lucky first found Wineland, and he then found merchants in evil plight at sea, and restored them to life by God's mercy; and he introduced Christianity into Greenland, which waxed there so, that an episcopal seat was established there at a place called Gardar. England and Scotland are one island, * * *

Dr. Storm attributed, not too positively, the unique and perfectly warranted hypothesis of an "open sea (the strait of Cabot) flowing in between Wineland and Markland" to a certain geographically minded Abbot Nicholas¹ of Thingeyri, who died in 1159. This would imply still greater antiquity for the accepted statement about Africa, which it accompanies as an after-thought and corollary. Note also that the passage preserves a tradition of disappointment hardly so clearly stated elsewhere. Apparently the carven door-post, or whatever else the doubtful name house-neat-timber may convey, was cut in Markland; and their next move, according to the saga of Thorfinn Karlsefni, took them that spring into temporarily pleasing quarters, where they afterward underwent a trying winter and nearly lost heart. This timber must be that which the Flateybook saga represents him as carrying to Europe and selling at a good price, then learning that it was mosur or mauser wood and worth far more—on all accounts a very doubtful anecdote. We shall have more to say of this material.

From 1285 to 1295 there are a series of entries in the Icelandic Annals concerning a certain new land west of Iceland, apparently including "the feather islands." This land and islands were found in the first year above given, and Land-Rolf, the zealous advocate of an expedition to thoroughly explore them, died in the later year named. During the interval he had been authorized and sent out by King Eric and had traveled through Iceland, gathering volunteers. If he had lived a little longer, something more might have come of it. We must not insist over-precisely on direction, which these and later people used very loosely. That it should be Markland, found again from another point and believed to be a new discovery, may seem strange, but to suppose with Reeves that the entries mean a part of Greenland—so much nearer and so long and well known—

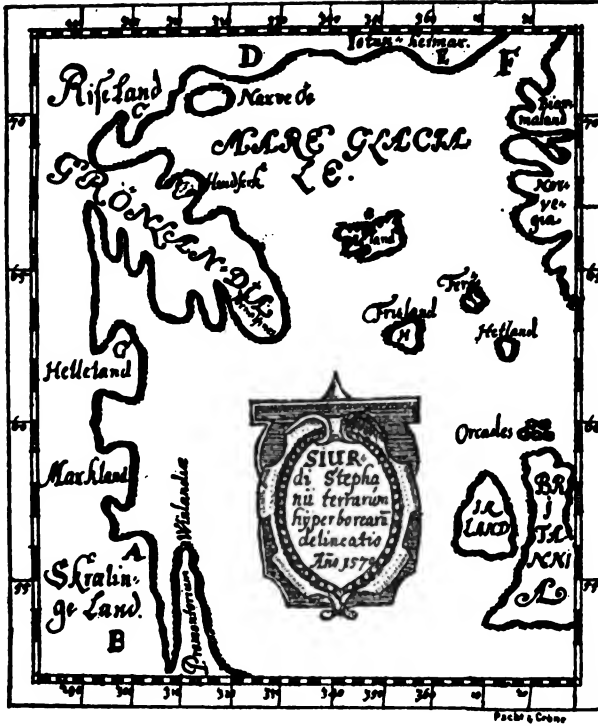
¹ More emphatically credited with the same in J. Fischer: *The Discoveries of the Northmen in America*.

is surely even more so. Perhaps the conspicuous out-jutting elbow of America, barely insular, which includes Newfoundland, was alternately visible and not visible to the knowledge of northern Europeans during several centuries, getting a new name—as Brazil, Forest-land, New-land, Escociland—every time it was brought again especially to attention, although the older name might also be used, as for another region.

This was a common phenomenon in old geography. Some early maps give Greenland a minor duplicate in "Grocland," off its west coast yet not so far as America; and the Faroe islands called Frisland, while retaining their place, gave birth in cartography to a fictitious great Frisland far away over the ocean. The name "feather islands" was applied later in substance to divers bird-crowded islets (for example Funk Island, Cartier's Bird Island) along our northeastern shore. On the whole it is likely that the latter was touched at some point, probably Newfoundland or near it, by these thirteenth century discoverers who effected so little. At any rate some such episode was currently related.

Arngrim Jonsson,¹ one of the few Icelandic authors who mentioned Wineland in the gray dawn of modern life, had for disciple and coadjutor young Sigurdr Stefánsson, a grandson of Bishop Gisli Jonsson of Skalholt, Iceland. Sigurd afterward took charge of the diocesan school at that place, unhappily being soon drowned in a neighboring river at 25 years of age. His chief memorial is a map of the northern regions, which has been copied by Torfaeus, Higginson, Wiess, Vining, and others, but not always quite accurately. Although it is a late document (probably 1590, though marked 1570) both its cartography and notes bear valuable witness to the tradition of his country, where national memory has always been most tenacious and at its best. This map shows a mountainous or hilly peninsula, marked Promontorium Winelandium, with its tip nearly opposite southern England, a tapering gulf behind it, and irresistibly suggesting by position and appearance a more slender Cape Breton Island—say the long, thin part beyond Bras D'Or. The narrow Gut of Canso, which now barely separates this area from the mainland, was of course unknown or disregarded, as by some of the European voyagers and map-makers of the sixteenth century. But this promontory was not considered the whole region or country of Wineland, for a note near the inner end of the Gulf behind it—hence also near the region about the head of the Bay of Fundy—states that Wineland is not far

¹G. Storm: *Studies on the Vineland Voyages*, before cited.



SIGURDR STEFÁNSSON MAP OF 1570 (1590?)
(From Studies on the Vineland Voyages, by Gustav Storm)

from that point; it also tells us that Wineland is called "the Good" from "its fertility or the abundance of its products," and the writer seems unconscious of any occult meaning. Another note adds that it is believed to border at the south on the "wild sea" and to be separated by a fiord or inlet from the America of the Spaniards. The former statement would fit either Nova Scotia or southern New England; the latter tempts one to recognize the Chesapeake, near the southwestern shore of which de Ayllon had planted his ill-fated little colony anticipating Jamestown. But we must not press inferences too far or too confidently.

Scandinavia¹ supplies the Hönen inscription of 1010 to 1050 A. D., existing in copy only, but held authentic by Prof. Bugge. It includes fragmentary letters which seem to make up "Vinland," with allusions to its remoteness in the seas and to neighboring cold regions. Dr. Nansen, however, thinks its "Vinlandia" may be a myth, located anywhere.

Taking all these minor evidences together, we find them affirming that there were three distinct regions south of Greenland, namely, Helluland, Markland, and Wineland, in that succession southward; that Wineland was perhaps cut off from Markland by water, but was not very distant, at least in its northern part; that its northern end was a promontory, and its southern face abutted on the sea, though it was perhaps connected to Africa; that it was prolific and especially notable for its spontaneous yield of grain and grapes; that Leif discovered it by accident and Thorfinn Karlsefni visited it, fought there with natives, losing Thorbrand, the son of his friend Snorri, and withdrew in disappointment; that Thorfinn's own son Snorri, was born in Wineland, and that he and Leif found valuable wood fit for carving. From the names we know that Markland was forest-clad and Helluland a region of flat stones and desolation. Perhaps we may fairly add that Wineland was understood to be of great extent, almost marching with Markland at its upper limit and with the later Spanish possessions at its lower. In other words it included perhaps all between the Chesapeake and the Gulf of St. Lawrence; but there is no need to insist emphatically on these boundaries.

This is the sum of our information; but even without any Wineland saga we should not be quite in darkness. Now, if there be two or more versions of the Wineland discovery and exploration, the presumption, other things being equal, strongly favors that one which

¹H. Hermannsson: *The Northmen in America*. *Islandica* No. 2 (Bibliography). See also Nansen: *Northern Mists*, vol. 2.

accords with these miscellaneous ancient data and the traditions embalmed by them. It so happens that there are three versions, two being so nearly identical that each of them fits the above items and differing only in minor details and special modes of statement: whereas the third, that of the Flateybook, though preserving many of these features, differs radically in others and adds a great number which are inconsistent therewith or inherently improbable and have no corroboration whatever.

9.—THE THREE SAGAS AND THEIR RELATIVE STATUS

The three extant sagas of Greenland colonization and Wineland discovery and exploration are very old manuscript copies on vellum, all the original documents being lost—as in other and even more important cases, where we must rely on secondary evidence for all that we believe of the past. Two of these sagas occur in compilations—Hauksbook and the Flateybook already mentioned—such as were often made for monasteries or prominent men, desiring to preserve in convenient form the literature or records which they valued. Miscellaneous matter therefore accompanies the sagas: Hauksbook, for example, having contained the Landnamabook and the Kristni-Saga, which Bishop Bryniolf separated for convenience in recopying, though they at last reached the same (Arne Magnean) collection. A few pages were lost in this disintegrating process, but these do not affect the Wineland narrative, which has always remained in the body of the book.

A. M. Reeves in *The Finding of Wineland the Good* has carefully worked out and authenticated all that is known of the history of the three sagas. Hauksbook, it appears, was copied for and partly by Hauk Erlandsson, a descendant of Snorri, the Winelander, son of Gudrid and Thorfinn; Hauk being also a well known personage of his time, a lawman in Iceland, as well as a knight and lawman of Norway, where he died in 1334. The work on this compilation is supposed to have begun much earlier and was probably completed at latest in 1332 during his last visit to Iceland. Hauk wrote in person the final passage of the saga, bringing the list of Snorri's descendants down to his own time and including himself by name and title (herra, acquired in 1305); also he copied about half of page 99 and two lines of page 100, his handwriting being well known and exemplified by a still extant letter. The remainder of the saga was copied by two assistants, known as his first and second Icelandic secretaries, the ink, penmanship, and orthography changing as they replace each other

in the task. There is no evidence that he or they composed any part of the saga except his genealogical pendant; but the contrary appears from the occurrence of every passage, excepting it only, in the parallel but verbally independent saga of Eric the Red. This fact causes also a very general belief that the latter was the title of the saga which he transcribed, but for some reason the copy in the Hauksbook began in the middle of one of the parchment pages with a blank space above it, as though the title had not been determined upon. Possibly he grudged the supremacy, even in title, of the founder of Greenland, believing his own ancestor's achievements more important still; yet, finding the usage well settled, he may have hesitated to disturb it. In the eighteenth century "The Saga of Thorfinn Karlsefni and Thorbrand Snorrason" was written in for title by Arne Magnusson, the greatest of Icelandic collectors and an authority whose every action or utterance is held significant; but whether there were any better warrant for this than convenience and completeness remains unknown. It is usually styled The Saga of Thorfinn Karlsefni; and must obviously have been copied between 1305 and 1334; but not from the same copy as the above mentioned saga of Eric the Red, for the differences between them, although slight, run through every part of the story, making everywhere for rather less archaic and graphic diction in the former saga and, when there is any difference in matter of substance, for less exact statement—a policy hardly to be carried out by three men in the same way through a whole saga. Hauk's close supervision might account for such changes, if we could suppose any sufficient motive for making the story everywhere a little less good as literature and in some places a little less serviceable as history. His career and his choice of material for the compilation do not favor the hypothesis of carelessness or lack of discrimination. Since these variations, then, can hardly be due to accident or to editing, we must suppose two slightly different antecedent copies—one being a little nearer the original than the other—from which the two surviving sagas were independently made. For convenience of distinction we adhere to the two names, but believe that the remote original bore Eric's name only.

The Flateybook's title-page recites that it was copied by two priests, whose names are given, for John Haconsson, known in other instances as a patron of such labors, the relevant parts of it being finished, as supposed, about 1387 or certainly before 1400; though there have been later additions, which do not concern us. This makes the transcription about three-quarters of a century later than that of the Saga of Thorfinn Karlsefni, roughly stated.

The parts in question form two chapters, separately imbedded in the Saga of Olaf Tryggvason, which is an important feature of that miscellaneous and bulky compilation, these having for titles respectively, *A Brief Narrative of Eric the Red* and *A Brief Narrative of the Greenlanders*, but being adapted to form a connected minor saga when put together. Probably this was their normal condition and the scribes dislocated them to build them into the longer saga, a common practice of that period. At any rate they have often been restored to this hypothetical continuity and so published, usually as *The Saga of Eric the Red*. This is manifestly confusing, an earlier claimant of that title being already in possession. It will be better to designate it *The Flateybook Wineland Saga*. The Flateybook is considered the handsomest as well as the most copious of all the Icelandic manuscripts. Formerly its Wineland narrative was sometimes assumed to have been composed in Greenland, perhaps from the nature of the two headings of its sections; but we do not know that any sagas were written there and discover nothing like affirmative testimony in this instance—which, indeed, seems close to a decisive negation. For the Flateybook version robs Eric's house of the claim to first discovery and charges his daughter Freydis with atrocious unbelievable crime. No one in any way connected with Eric or accepting his or his son's leadership could be expected to tolerate it. Even remote descendants would not enjoy the hearing or reading.

Some Scandinavian writers (see Reeves's notes) have credited this version conjecturally to the north of Iceland, others lay stress on the undoubted first finding of it as an heirloom in the west on Flat-island of Broadfirth, but cannot follow the trail much farther. Back of its rather late emergence there is a long period unaccounted for, and its place of origin is unknown.

The Arne-Magnean vellum MS. 557 quarto, containing the third of these old sagas, must have been copied about 1400, according to Vigfusson and other Icelandic authorities. Its transcriber did not have Hauksbook before him, because he copied more archaic terms and even some slight verbal errors, not in the saga of Thorfinn Karlsefni, but evidently from the lost original or an intermediate copy—most likely the latter. Also, as pointed out by Prof. Olson, it does not have the ending of the pedigree, which Hauk personally added.

A. M. Reeves mentions two verbal items, which, on the face of them, appear to favor the Flateybook. It gives the name *Midiokul* for the first point in Greenland sighted by Eric, adding that it is "now called Blacksark." The Thorfinn saga calls it Blacksark only; that of Eric the Red, perhaps by the transcriber's error, calls it only

Whitesark—the Hutisark of Olaus Magnus. But the composer of the remote common original of the last two sagas may not have remembered the earliest name or may have passed it by as unimportant, and the passage does not occur in the Wineland-voyage narrative, but in the preliminary account of the achievements of Eric Raudi, which may rest on a different time basis. In any case it would be a slight reed to lean on, supporting the burden of so much contrary evidence.

Likewise of the two Brands. The two parallel sagas say "Bishop Brand the elder," which of course could not have been written before the second Bishop Brand was consecrated—in 1263. The Flateybook says "Bishop Brand" only, which might have been written at any date after the consecration of the first Bishop of that name and before that of the second one, but also may have been written after the latter event, if the Flateybook saga-man happened to lose sight of one bishop. Moreover this is in the genealogical tail of the story, presumably added from time to time, as we see in Hauk's case, and does not throw any more light on the date of the body of the saga than a birth-entry or death-entry in a family Bible throws on the date of the neighboring book of Genesis.

Hauk Erlendssen might not notice the omission of the elder Brand or of a mountain's obsolete name—if he knew it—but he was too prominent and cordially interested a descendant of Thorfinn and Gudrid not to be an authority—probably the best one then living—on the family traditions of descent and achievement; so his copying and evident endorsement of the saga of Thorfinn Karlsefni is a strong argument for its claims, as to all the main points at least, though he should probably have given it the original name *The Saga of Eric the Red*.

In particular, how can we suppose him ignorant whether his ancestress was the granddaughter of Vifil of Vifilsdale and went to Greenland as an unmarried girl with her father Thorbiorn; or whether she was picked up, a kinless woman, by Leif from a wreck at sea, together with an otherwise unknown and quite apochryphal first husband, Thori the Eastman? Either Hauk was thus incredibly ignorant, or he wilfully falsified the record to glorify his ancestors, or the version preferred by him is the right one. The former two alternatives contravene his known standing and character, as well as all the early writings (except the Flateybook) touching this subject; the third has simply nothing but the Flateybook against it.

This instance is characteristic of the latter's elaborated saga, which must have been produced at so late a day that liberties with family

history were felt to be tolerably safe. Yet it seems to have been almost suppressed for two centuries, Mr. Reeves's¹ diligent search having discovered but one copy made from it, as against about thirty made from the other two sagas, which, in general outline, chief events and most minor details, are really one. It seems, then, that the Flateybook saga never can have had much influence in its own home until put forward in print by scholars of Continental Europe; whereas the earlier and simpler form of the narrative was accepted as authentic not only by the descendants of the explorers but by their Icelandic neighbors and fellow countrymen.

Their styles afford another criterion; it being well known that hardly any literature is so directly, impressively, and nobly epic, so Homeric in quality, as the early Icelandic sagas, but that, as always, the first flush of power was succeeded after a time by greater (or more obvious) self-consciousness and love of adornment, producing good work, yet not so good as before and easily distinguishable. Even in the English translation we must feel that the saga of Thorfinn Karlsefni belongs to an earlier and nobler period than the Flateybook story.

Scandinavian scholars, more intimately enlightened, bear this out with emphasis. Storm insists that the composition of the latter saga cannot long have preceded its copying, thus making the date perhaps 1350 to 1380; whereas he suggests 1270 for the other narrative; and the later consideration of Finnur Jonsson, an excellent authority, quoted by Olson² with approval, carries this back to 1200 confidently.

Embedded in that early prose are two epigrammatic fragments of verse, which no doubt antedate all sagas, following a general law the world over. Storm has shown that their metre indicates the eleventh century and Reeves has pointed out a very archaic choice and form of language. There has been difficulty in exactly determining the meaning, and some variants in certain later copies apparently have none in part, the sounds and forms persisting without it, through reverence for tradition, as often happens everywhere. They claim on the face of them to have been composed in Wineland during Karlsefni's expedition, and though no great reliance be placed on this, we may be sure that they are the most nearly contemporary compositions on the subject (except his sailing directions embedded in the saga) which we are ever likely to see.

The framework of the two versions may be compared instructively. According to "Eric the Red" and "Thorfinn Karlsefni," Leif the son

¹A. M. Reeves: *The Finding of Wineland the Good*. Appended Notes.

²Julius E. Olson: *Original Narratives of Early Amer. History*, vol. 1, notes.

of Eric accidentally discovered Wineland as already stated. Thorstein, his brother, failed in an attempt to reach it the next year and returned, marrying Gudrid soon afterward. That winter he died. After a time she married Thorfinn Karlsefni and set out with him for Wineland. They reached in succession Helluland, Markland, the peninsula of Keelness, the Wonderstrands and Straumey and Straumfiord of the sea currents. They made their home for the winter, first in a bay behind Straumey, then on the island itself; finally on both, getting the benefit of both regions. In the spring they went south, finding another bay or loch called Hóp by them, into which a river flowed, passing thence by a strait to the sea. Here they spent a year, but at last had to leave on account of the hostility of the natives. They returned to Straumey and spent another year there unmolested, incidentally exploring the other side of Keelness, apparently the southeast shore of the Gulf of St. Lawrence, including a part of what is sometimes called the Acadian Bay. Here Thorvald their helmsman, another son of Eric, was killed by an archer of great activity, whom they thought abnormal. Quarrels among themselves about the married women caused their return to Greenland, thence to Iceland. Biarni, one of Thorfinn's noblest companions, went down at sea on the way, having given his life in a sinking ship for that of an unworthy follower.

The Flateybook saga, it would seem, rewards this Biarni by making him, not Leif, the accidental discoverer of Wineland, he being on the way from Iceland to Heriulfsness in Greenland, following his father Heriulf—a relationship unknown to Landnamabook. He touched three lands, evidently meant for those of Karlsefni taken in reverse order, the upper part of Wineland being first found. Biarni did not die, but safely reached the shore in front of his father's house, on his first approach to Greenland, an improbable achievement often substantially repeated in this saga. Leif blamed Biarni for not landing on any shore that he discovered, so he borrowed Biarni's ship and sailed forth to remedy the error. He found the three "lands," this time in north-to-south order, and built, "Leif's-booths" on the shore of a bay, which seems a composite of the southern Hóp and the northern bay behind Straumey. He returned to Greenland for no reason given, picking up Thori the Eastman and his wife Gudrid from a wreck on the way.

Next, Leif's brother Thorvald borrowed the ship and the Wineland house and reached the latter without any recorded difficulty. From this abiding place he explored the coast westward a long way and afterward explored eastward also to Keelness, turned that cape.

found and killed eight natives and sustained in the ship the resulting attack of many canoes. An arrow from one of them killed him and there is a pretty bit about his burial at Crossness. His party returned to Greenland.

Next, Thorfinn, having married Gudrid, sailed with her to find Thorvald's grave, not Wineland in its own right. They were beaten about and returned unsuccessful, squarely hitting in the first landfall his home at Lysufirth far up the coast. He died, and she returned to Ericsfirth and married Thorfinn Karlsefni in due course.

They sailed, and found Leif's-booths and dwelt there. Gudrid gave birth to Snorri. Indians came and they trafficked and fought with them, but at last withdrew to Greenland from that hostility. Thorfinn carried Wineland products to Europe and bought property near his former home in northern Iceland, where he lived and died.

Last of all, Freydis led an expedition to Leif's-booths, quarreled with companions about occupancy and other things, and in the end very wantonly and treacherously compassed the murder of a whole ship's crew, chopping to death all the women, after capture, with her own hand. She returned with a false tale, but Leif suspected and tortured her followers into confession, though he spared her as his sister, while predicting evil.

It will be seen that the Flateybook saga substitutes five voyages that reached Wineland for only two, using as additional leaders nearly all the names made prominent in the earlier narrative. Necessarily it has divided up Karlsefni's experiences and geography and filled them out with other matter to make them go around, thus causing confusion. For the same reason and to be more exciting, minor items and hints have been elaborated, sometimes with misunderstanding, and in other instances with shifting of place. For example Thorvald's death in battle, Christian sentiments and picturesque burial—the result of a wanton massacre properly punished—seem to have been worked up from two simple unconnected items in the saga of Thorfinn Karlsefni, put together for dramatic effect; and the momentary frenzy of Freydis before the yelling Indians is interpreted as furious malignity and developed into a nightmarish and quite unbelievable episode. Perhaps, as Dr. Storm suggests, the reference to quarrels over married women may have been another germ in this case, though affording little material.

In substituting a voyage from Iceland for a voyage from Norway, the probability of an accidental view of America, as he points out, has been destroyed. Greenland is so near Iceland that any one missing its lower tip would discover and put about long before

crossing the very much greater interval to America, whereas the full width of the ocean would leave many chances of strange happenings and miscalculations in times before the mariners' compass and accurate means of observation. It is not known that any ship out of Iceland for Greenland ever made America first, but long after Thorfinn's time, Cabot with far better equipment, and a century later Hudson, sailing from northwestern Europe for Greenland or the extreme northeast of Labrador, were directed to a more southern shore; the former by a discouraging southward drift of ice, the latter by the bodily force of storms. Prof. Horsford¹ has compiled and printed an instructive chart, showing the recorded drift of many derelicts and storm-driven vessels to New England under the dominance of the currents from the north and the prevailing winds. But to fall within their power one must sail low enough.

Leif's alleged Wineland house, too, is a monument of improbability—being found by each one of the later parties, with years between them, and always incredibly ready for occupancy, even after the neighboring savages had gone to war with the temporary white intruders and would have liked nothing better than to loot and burn. It is hardly necessary to cite the angry Indians who "pulled out the cross"² from the grave of "Champlain's" follower and "dugged up the body" to make their savage sport with it. Why should they spare an enemy's home? We need not pick out and dwell upon all such untenable items. Mr. Reeves has afforded every facility in *The Finding of Wineland* for a word by word comparison, either in the original handwritten Icelandic, or the same in print, or the printed English translation. It is disappointing to find Dr. Fiske declaring of the additional voyages, "it seems to me likely that the Flateybook here preserves the details of an older tradition too summarily epitomized in the Hauksbook," for surely the law of literary development is from the simple to the complex. There are some exceptions, perhaps; but the internal evidence is strongly adverse to the supposition that we have one before us. Dr. Fiske's notes clearly show that he had not seen the above work of Reeves and the English translation of Storm's paper until after his own text was prepared; and he can hardly have given them adequate consideration. The Flateybook Wineland saga bears the familiar marks of derivation and development. This does not necessarily mean that the composer of it had "Eric the Red" or "Thorfinn Karlsefni"

¹ Horsford: *The Landfall of Leif*, p. 42.

² M. Lescarbot: *Nova Francia*. Erondelle's transl., p. 105.

before him, or either of the parchments from which they were copied. More likely there was another copy or more than one, almost identical in some parts—for whole sentences are practically repeated, though not always in the same place—but with omissions, additions, and changes; and further traditional material, oral or written, may have been worked in for the first time during transcription. Thus Gudrid's antecedents and first appearance differ widely in the accounts, as we have seen, but there is a close parallelism in the episode of the western settlement, though some passages are not common to both. Undoubtedly we find greater dignity and deeper tragedy in the Hauksbook version, particularly as concerns the behavior of Gudrid herself in the grief and horror of that uncanny death-night. It seems the elder form, but the other must have developed early. Both put words of prophecy in Thorstein's mouth, most reasonably explained as, at least in part, of later interpolation. They display a knowledge of Gudrid's religious eminence toward the close of her life and the subsequent prosperity of her family.

The Flateybook Wineland saga is chiefly important as at least partly independent testimony to much that is recorded in the others; and for some items which it adds that seem authentic. If all else were lost, we might still learn from it of Helluland, Markland, Wineland and Keelness, their relative position and their chief characteristics; the island north of the lower end of the land, which is almost the direction of Grand Manan after rounding the southwestern tip of Nova Scotia; the behavior of the tide and the great shallows left on the ebb, suiting equally Thorfinn's great currents and what may be seen now along the lateral bays and rivers of the Great Bay of Fundy the fiord-indented mountainous shore of New Brunswick and Maine just beyond; the voyages of Leif and Thorfinn; the birth of Snorri and the death of Thorvald, both in Wineland; the savages who had furs to trade and were improvident in dealing, who took flight at the bellowing of a bull and afterward attacked the settlers with fury; the two days' sail between Helluland and Markland and between Markland and Wineland—with divers other matters alike in all versions. As added items we have Thorfinn's stockade, a precaution which he would be likely to borrow from his enemies after danger threatened; the piling of timber above a cliff, perhaps as now, where a shute or runway shows at the north point of Grand Manan; the tall and striking figure of the hostile chief; the wooden structure on an island, possibly a shed or bin for wild rice gathered by Indian women, who are still the chief garnerers of the northwest, and a much-expounded statement that

the sun had eyktarstad and dagmalastad on the shortest day of winter.

The history of the controversy over this latter item will be found in Reeves's notes appended to *The Finding of Wineland the Good*, with the verdict of two astronomical experts, working independently on both sides of the Atlantic, that it proves only a northern limit about the upper end of Newfoundland. In other words, Leif or rather Thorfinn can not have been farther northward than this at the time of taking the observation, but may have been somewhat farther south—how far is not stated.

Bishop Howley¹ presents what may be called the gastronomic view, as opposed to the celestial. Dagmalastad is admittedly breakfast-time, and the eykt measured the interval to the afternoon meal. Thus regarded, the Icelanders were merely expressing their satisfaction at being able to eat both meals by sunlight every day through the winter. Of course they were sailors and practical would-be settlers and this view is somewhat tempting at first glance.

But they really could take observations at need after a fashion, and were willing to report the same for the people at home; as in the celebrated case of that Arctic expedition in 1266, which went farther than any one could follow it until the nineteenth century. The sun, they reported, shone about July 25th over the gunwale of a seven-oared boat on the face of a man lying across the bottom with his head against the opposite rail. Also at a given time the sun was as high at midnight as when it was in the northwest in settled Greenland. The first latitude depends in part on the height of the gunwale and the exact position of the man's face; the second on the chosen point of the settlement. Probably there was approximately a standard size and pattern of boat and Gardar would be understood as the home observatory; so these two made after all a pair of rough and ready indications; from which Rafn deduced a parallel between the 75th and 76th degrees. Thalbitzer thinks they probably did not pass the 73d, but bases his estimate on matters of the coast-outline rather than calculation. This primitive nautical observation makes a good precedent for the Flateybook statement, which also has an authentic look, although there is no record of it before 1387 or thereabout.

Apparently it relates to the northern dwelling-place beside Straumfiord, which may well come within the limits allowed by the modern astronomers' calculation, especially if we allow for some

¹ Vinland Vindicated, before cited.

looseness of language as in the other case. It is true that the characteristics of Hóp are blended with those of Straumfjord in the confusion of this corrupted saga; but the latter preponderate on the whole and we cannot suppose the more southerly point to be intended. Grand Manan would have made a good observatory. But no doubt Dr. Fiske is right in holding that the context implies a length of winter day which surprised them; so it must have exceeded that at Dublin, or even Rouen, which they currently visited in their trading voyages. Perhaps we might add Bordeaux, taken by their Norse kinfolk a century or two before and which they may have known very well, but this after all is hardly certain enough for reliance.

They were no doubt the first observers of the difference between isothermal lines and lines of latitude crossing the Atlantic ocean, a dislocation which the human mind even yet finds it hard to realize or regard as quite natural. Some point in southern New England seems called for; though possibly Yarmouth or Eastport might do.

It would be interesting to know whence these bits of really illuminating tradition drifted into the Flateybook version, but they cannot offset the grave charges against it. The preference long and generally given this later derivative and corrupted saga has been one of the chief causes of investigation going astray. Two others are a persistent conception of Wineland as an organized continuing colony and the innocent acceptance of the present seaboard as that of the year 1000. Of course there are still others.

Dr. Fiske says in a note it "is like summer boarders in the country struggling to tell one another where they have been to drive—past a school-house, down a steep hill, through some woods and by a saw mill"; for "the same general discription will often apply well enough to several different places." This is an apt illustration of the muddled and unhelpful presentation of locality in the Flateybook, but does not apply at all to the graphic, precise, and individualized sailing directions of the earlier Hauksbook saga, or still better, its companion Eric the Red.

Bishop Bryniolf, with a discoverer's delight, no doubt impressed the importance of his ample and beautiful prize on Torfæus and the royal recipient, and it was most natural that the historian should put its version prominently forward in his history (1705), the first of all books on Wineland, though printing with it the Saga of Thorfinn Karlsefni; also that the great von Humboldt, knowing no Icelandic, should accept his verdict and consider mainly in the *Examen Critique* those two chapters from the Tryggvason saga, though not failing to note the evident effect of long continued oral transmission on an

originally simple story. Successive writers, in rather lengthened series, mainly took their cue from these works, with little heed to his warning, so that their widely differing schemes of the explorations were based on the Flateybook's entangled, blurred, disjointed and bewildering data—and likewise the objections of the sceptical dealt often with items misreported or lacking foundation. Rafn's voluminous *Antiquitates Americanæ*, though doing the great service of presenting almost the entire array of Scandinavian evidence and urging the subject effectively on public attention, repeated this time-honored error, adding to it the Newport tower, the Dighton rock, wild Indian-corn and other damaging credulities. Even Vigfusson's *Origines Islandicæ*, published long after his death, held in the text the same ground about the Flateybook, contradicting one of its own notes, and provoking Professor Olson's very natural suggestion that "some hand less cunning than Vigfusson's" had perhaps been at work. Similarly Fiske's *Discovery of America* adheres generally in the text to the Flateybook, though its notes feel the influence of new light recently received.

Dr. Gustav Storm of Christiania was the first to present effectively the true state of the case in his pivotal *Studies on the Vineland Voyages*, an English translation of which will be found in the *Mémoires de la Société Royale des Antiquaires du Nord* 1888. Reeves followed his lead (1890) in *The Finding of Wineland the Good*, a work characterized by Dr. Fiske as "the best book we have on the subject in English or perhaps in any language." Probably it is so, if by "best" we understand the most accurate and elaborate within its limits, rather than the most original. It is the only one giving facsimiles of the vellum pages of the Wineland sagas and an approximately complete list of the extant later copies, its reproductions in print of the original Icelandic, with line for line carefully stated English translations, are accepted as the most reliable and it adds by footnotes and final notes, in data and commentary, a very great amount of new and highly instructive material. But he passes by almost wholly the subject of localities which his forerunner had treated with great care and, as to most points, I think, with nearly exact insight. Dieserud¹ (1901), in a valuable paper before the American Geographical Society, and Olson in his condensed and clear preface to the *Voyages of the Northmen in the Scribner's series "The Original Narratives of Early American History"* have emphatically taken the same ground; which is not likely to be lost again.

¹ Juul Dieserud: *Norse Discoveries in America*. Reprint from *Bull. Amer. Geogr. Soc.*

10.—THE MOST AUTHENTIC WINELAND HISTORY

Reeves, treating the two parallel sagas as practically one, has presented an English version which follows the "Thorfinn Karlsefni" Hauksbook almost exclusively in the text, giving by foot-notes the corresponding words of "Eric the Red," where these differ. It will be better to reverse this preference here, incidentally mentioning such divergencies of the first named saga as may seem helpful.

Two centuries at least intervened between the events narrated and the composition of the earliest form of the complete saga. We have to consider, then, just what this word means and how far what it stands for may be relied on after so long a time had elapsed. Saga, we are told, meant story, broadly; though a more restricted significance is given by later usage; and stories, of course, are of many kinds. The Book of Ruth, Freeman's Norman Conquest, Mark Twain's Innocents Abroad, and Henry James' ghastly *The Turn of the Screw*, are all undeniably stories. In early Iceland the case was the same. The *Heimskringla* is an honest rendering of history on the great scale, very picturesquely given, for a long line of northern kings, in accordance with the tests and standards then available; the *Bandamanna Saga* is an almost dainty bit of comedy, with social and political strategy for its fabric and an altogether delightful prodigal father, artfully helpful at need, for its very most winning figure; the *Volsunga Saga* is perhaps the greatest of myth stories, with Shakespearean dramatic qualities in all its later portion, as Andrew Lang has written; the *Saga of Nial the Burned*—one of the great works of the world—contains as sound and noble characterization as may be found anywhere and the most complete of all presentations of the practical working of early law; the *Grettir Saga* is a Robin Hood romance, touched with human sympathy and deepened to awful tragedy by the haunting of evil eyes, dead and damned, never relenting, which bring fear where no fear was and force him to endure the company of assassins rather than face the dark, so preparing his inevitable doom; the *Saga of Cormac* is a string of his poems or those attributed to him, like so many beads, on a fine thread of wayward northern love-story and travel; and the same may be said of *Gunnlaug the Serpent Tongue*, though in a more comforting and cheerful key. The list of deviations might be very greatly increased without effort.

In a field so varied every way, there should be room for a ship's log and business-like statement of explorers' notes, afterward filled out with items and episodes derived originally from members of the

party. This is what we seem to have in the voyage-section of the Saga of Thorfinn Karlsefni. But of course we should be on our guard against all signs of later sophistication.

It certainly means to tell the substantial truth, as did most of the writings, not avowedly mythical or fanciful, of that early time. The period of extravagances, like the Arrow-Odd Saga, of imitations and forgeries and of literary sentimental productions, often very pretty but quite openly fictitious, like Frithiof's Saga and the Saga of Viglund the Fair, was yet far ahead. The conscientiousness of the Landnamabook had set the pace, and men wrote historically, anxious not to vary from the essential truth of what had befallen.

Unfortunately only a minority of these earlier Icelandic sagas remain—some thirty-five in all; for the world has lost a great treasure. It is natural that we should prize them, even overrate them, when we are induced to know them at all; but we must not regard them quite as we should the modern painstaking work of a Parkman or a Motley. Their composers were quite without our tests of probability in many things, notably in things supernatural. Even the ghost-game was under different and prodigious rules, which we find out of keeping; for a ghost came usually in the body and veritably out of the grave or dripping from the sea, and he could be clutched and broken and killed like a man. With them the gruesome, fully believed in, quite reached its climax. What iron nerves the northern people must have had to support existence!

Moreover, like all unsophisticated non-analytical folk, these narrators were liable to confuse their own inferences with what actually was, or could be, known; the best of them is as ready as any Greek historian with his word-for-word dialogues of two centuries earlier, though these were admittedly unrecorded at the time of utterance and most unlikely to linger for a week without change in any mind. The truth of the sagas¹ is not then in all cases that of absolute precision. They aimed to present past conditions and occurrences in the most graphic and dramatic fashion, making them live again for the reader or hearer. Apparently the Old Testament narratives were their model; their own histories developing and diverging from it in so far as their customs, ideals, and beliefs differed from those of its writers, and the work of each saga-man being conditioned by the special material before him, as well as by his individual gifts.

The first sagas were doubtless very simple and oral, having for contemporaries brief stories and spell-songs in verse, occasionally

¹ Yet see Laing's preface to *Heimskringla*, p. 188, concerning the local fidelity of the Orkneying Saga.

carved in wood in the runic alphabet, as told us by Egil's Saga; magic formulas and sailing directions, besides other useful memoranda, being also thus preserved. Such tales were a part of education, as well as a means of entertainment, wherever people gathered, say at the Althing, or about their home-fires in the long halls during the earlier hours of winter nights.

When Ari Frodi inaugurated Icelandic prose literature a little after the year 1100, the experiment "took" as we say, but most of his disciples or emulators must have found it easier to write briefly. Later the tales of a neighborhood or those that hung about a notable man would often be welded together by other hands. If this work were done mainly by one writer there would be general unity of style and literary effect, but with the original elements yet distinguishable. The great sagas are all of this composite character; yet with this imposed artistic unity, though it may be harder to dissect Egla or Laxdaela than the Eyrbyggja Saga, which almost dissects itself.

Our Wineland saga, though not the longest, is clearly of their class and kind. It seems that a shorter Saga of Eric the Red and one of Thorfinn Karlsefni's voyage must have been thus united in it, including also parts of a lost saga of Leif—other fragments of the latter being represented perhaps by the Thorgunna chapters of the Eyrbyggja Saga. The same hand has polished and kneaded it all, introducing some illustrative adornments like the incantation scene, chiefly, though not quite exclusively, in the preliminary Greenland section. There seems to have been great care on the part of this final saga-man, say of 1200, not to confuse or distort Thorfinn's careful memoranda of coastal geography.

As the saga comes to us, the contrast in subject matter is obvious and great. The phantoms, miracles, magic, and prophecy are all in the earlier Greenland part, the sailing directions all in that relating to Wineland. The former must be considered an historical romance, embodying all that we know of Red Eric, as well as Gudrid's ancestry and early life, her loves and bereavements; the latter is a matter of fact statement of her unique adventure in exploration with her husband, adding bits of information and episodical anecdote. The record making the backbone of this voyage-history might have been originally in very few words, not vastly exceeding the inscription found on one of the Women's Islands in Baffin's Bay. That such guides to future explorers, travelers, traders and colonists were matters of care and conscience to competent early navigators appears very clearly from Champlain's seventeenth century account of the way to get into the Penobscot, Ivar Bardsen's fourteenth century account of the way

to reach the Greenland colony and the ancient memoranda repeated by the 12th century *Landnamabook*. There would be plenty of opportunity for that brief Norse record, during their shipboard life and the three Wineland winters. So careful a man as Thorfinn, with such a wife as Guðrid beside him, seeking to plant a colony and show others the way, surely would not have left this important matter to the chances of memory only. Runes would have answered very well, the task being light and easy. The result is the only saga of exploration, with just one other to be doubtfully excepted.

The residuum of verse¹ in it may seem odd company for coast-notes and distances, though Thorhall's derision in that form had a very practical turn at the end of an unsatisfying winter; but verses often appear in Icelandic sagas. Sometimes they are the known productions of the poet-champions celebrated, or imitation of their work, both kinds being exemplified by the sagas of Cormac and Egil; sometimes, as in *Gretla*, they are chiefly foreign interpolations of no taste nor skill; or again they may be real or supposed relics of older balladry. In the *Saga of the Heath-Slayings*—that savage, unforgettable epic, which somehow recalls the equally intense and primitive old Scotch border-ballad with the refrain "and my gear's a gone"—the basic tales in verse are not always quoted from, but cited occasionally by the prior author's name. Both plans are largely and about equally adopted in the *Eyrbyggja Saga*.

In the *Saga of Eric the Red*, a not extravagant ingenuity may distinguish the episodes of Thorhall the Huntsman, the Gaelic Runners, the Battle at Hóp, the Death of Thorvald, the Markland Captives, and the Death of Biarni, each easily separable and individual, as probably single ballads in their original shape. That of the Gaels Haki and Hækia has been inserted in the wrong place, presumably by the final saga-writer, making them find grapes and grain before finding birds' eggs and having an overlapping joint with the context, more instantly obvious than that of the two creation legends in *Genesis*. This anecdote, if veracious, belongs evidently to the next autumn at earliest.

The place-names of the saga have been transferred from Iceland, for example, Hóp, Straumey, and Kjalarness, just as Oxford of Maryland or Plymouth of Massachusetts derived their names through English colonists from English towns; or they are descriptive and of general application where the same conditions prevail, as Markland

¹ Prof. Diman's critique of De Costa's "Pre-Columbian Discovery." *North American Review*, 1869, vol. 109, p. 269.

or Helluland; or commemorative, as Biarney, where they slew a bear. Furdurstrandir, The Wonderstrands, if not obviously and precisely descriptive, is descriptively explained in the sagas, only one meaning being given by them; which there is strong reason to accept. However, Dr. Nansen dissents (see *In Northern Mists*), and would make it commemorate some undisclosed wonders, or possibly a memory picture of beautiful tropical islands, seen or heard about or of mythical heavens anciently modeled thereon. The topic will be resumed in a later chapter. The name is not on the Iceland maps, and Mr. Stefánsson of the Library of Congress, a south-Icelander by birth and long residence, does not know of it there.

Apparently this is the one invention of the explorers in local nomenclature and one of the most significant items of their saga, defining aptly the impression of the typical American sea-shore of interminable strand and dune, which they could never have encountered before and would never afterward find elsewhere. It would have been equally unknown to the later saga-man or even to Hauk Erlendson, who copied him in the first third of the fourteenth century since neither of these could be aware of anything distinctively American except from the Wineland sagas and traditions.

The methods of naming above-mentioned overlap in some degree, so that it is not always possible to say whether old, general associations or new observation have had the greater share. One would say that these Icelandic visitors were rather more careful than some of their successors to avoid such incongruities as the Naples of interior New York, or as Snow Hill, a county seat beside a small cypress-bordered river in a flat farming region near the sea. But no doubt it is safe to distrust unlikely and uncorroborated explanations of the saga names or events, especially where we are given a choice of two in different versions; for example, the alternatives about Keelness or the two accounts of the first finding of the grapes. They have the air of afterthoughts, accounting for or illustrating some item as to which there was no further light, but which the saga-men, or the composers of material which they incorporated, were not self-denying enough to merely leave as found.

The personages of the story were born, and for the most part reared, under the Northern pre-Christian religion; so it would not seem strange to find Thor's name occurring as frequently as that of Jesus still does in Mexico, or as those of St. Patrick or St. Michael do in Ireland; yet it must be admitted that Thord, Thorhall, Thorbiorn, Thorwald, the two Thorsteins, Thorgunna, and several others, occurring in a single saga, not of the longest, may be counted exces-

sive. Some of these are borne out by the *Landnamabók*; others are possibly stop-gaps of later invention occurring chiefly in the least historical parts of Eric the Red, preceding the voyage of Thorfinn.

As already indicated, the incantation scene, the death of Thorstein, and other episodes, though good Icelandic folk-lore and excellent imaginative literature, are by no means to be treated as unalloyed fact. There seems no especial reason why we should look for greater accuracy as to names. Some of those not supplied by independent and trusted authority may be derived from sound tradition; but here we have little to guide us. Their accuracy or inaccuracy does not touch the general course of the voyage—any more than errors in a roster of troops would disprove the battle of Saratoga.

II.—THE STORY OF THE FIRST AMERICAN MOTHER

Gudrid is unmistakably the heroine of the saga and fills admirably a good part of its Greenland section—as winning and nobly gracious a womanly figure as may readily be found in any literature. The greatest of feminine explorers, the inspirer of the earliest attempt to colonize America and sharer in all its hardships, and the mother of the first-born white American, she must not lightly be passed by. Her father Thorbiorn held his ground after Eric's first departure and for some years declined his invitations to Greenland. But Thorbiorn was somehow losing ground among his people; and felt this brought home to him unbearably when a disparaging offer of marriage for Gudrid (as he considered it) was urged by an old friend, of whom he expected kinder things. Apparently she felt with him; for there seems to have been no attempt at dissuasion, even when he called their numerous well-wishers together in a great banquet, made a speech about his honor and, lavishing gifts on them all, announced his intention to sell out and emigrate. Perhaps she may have shared his adventurous longing for the chances of life in a new field and found no resisting magnet in any of her numerous Iceland suitors, indicated by the saga.

All that remained to them went in that ship, and certain friends joined the company, to their cost in some instances, for there was sickness and death on the way. It was indeed a dreadful voyage, of prolonged storm and unceasing hardship and danger; but they won at last to the lowest settled peninsula of Greenland, Herjolfsness, where they were received for the winter. Remains of a church and other vestiges have been considered to mark the spot; with no abso-

lute certainty, however. Judging by other sagas¹ dealing with the colony, it was the point most often first reached by all newcomers, working up toward Ericsfirth or Gardar, and sometimes they had to remain there literally for a season. Presumably it was also the chief point of departure of the little Greenland fishing fleet, and any disaster to it, or any ill success, would be felt there most quickly and severely. One Thorkel was then in possession at Heriolfssness, according to the saga.

The misfortunes of the emigrants were not yet quite ended. The storms which had quite roughly used them were unfriendly to their entertainers also, for most fishermen had come back with light catches "and some had not returned." The infant Greenland colony suffered and was stinted. As the winter drew on, Thorkel and his neighbors grew anxious and depressed. Pagan still, though with a slippery grasp on the old belief, they decided to call in the aid of a seeress or prophetess having occult powers; who shows us what Scott's Norna might have been in the palmy days of her craft and in cheerier vigor of life. It was her custom to visit on invitation various homes, where the people gathered in the hope of good words for the future as the spirits might give her light. Thorbiorg was her name and she was the youngest of nine sisters, all with this gift of prophecy, a truly formidable array. Says the saga²:

When she came in the evening, with the man who had been sent to meet her, she was clad in a dark-blue coat, fastened with a strap and set with stones quite down to the hem. She wore glass beads around her neck, and upon her head a black lamb-skin hood, lined with white cat-skin. In her hands she carried a staff, upon which there was a knob, which was ornamented with brass, and set with stones up about the knob. Circling her waist she wore a girdle of touch-wood, and attached to it a great skin pouch, in which she kept the charms. . . . She wore upon her feet shaggy calf-skin shoes, with long, tough latchets, upon the ends of which there were large brass buttons. She had cat-skin gloves upon her hands, which were white inside and lined with fur. When she entered all of the folk felt it to be their duty to offer becoming greetings.

She was provided as usual with a sort of throne on a dais and with special food, a leading feature being the hearts of every animal which could be procured in that region. She would not prophesy the first night, but slept in the house; and the next day had a circle of participants formed before her. Then she called for some woman to sing a certain "spell" of subtle power; but there was none to be found who knew the song until Gudrid owned that it had been taught

¹ *E. g.* The Saga of Thorgisl. *Origines Islandicæ*, Vigfusson and Powell.

² A. M. Reeves: *The Finding of Wineland the Good*, p. 33.

her in Iceland by her foster mother; yet it was of such nature that she must not sing it now, being a Christian. Thorbiorg made answer that she might sing it nevertheless to aid her friends and be no worse woman for that; yet left the matter in the hands of Thorkel. Under this urgency and in plain contrast to her father's course, for he had withdrawn altogether, Gudrid admitted at last that she felt bound to do her part for those about her; and all, as they listened to her singing, felt that they had never heard the mystical song rendered so sweetly. Thorbiorg was very gracious in requital, thanking her for luring among them divers spirits which most often held aloof and would answer nothing, but loved such a treat. With this aid, she promised improved conditions for the colony; and for Gudrid, abundant prosperity and distinction, ranging beyond her, in Iceland, to her lucky descendants. Then she departed and the scandalized Thorbiorn returned.

Not very long afterward the ice broke up along shore with the opening spring and Thorbiorn and Gudrid were free to sail to Ericsfirth and Brattahlid, where the redoubtable ruddy Eric met them "with both hands" of welcome. They made their home with him until another could be provided on one of the nesses protruding like that of Heriolf.

That autumn Leif appeared among them with his inspiring tale of a fruitful Wineland in the southwest and certain valued products to make his words good; also with a priest and teachers to Christianize the people and some men whom he had rescued from a wreck at sea. Seldom have so many welcome sensations been presented at once to a people hungry for tidings. Except a minority, including Eric himself, Thorhall the Huntsman, and Thorstein the Swarthy of Lysufirth, all were in the best of mood to receive his religious message favorably and this work seems fully to have claimed him. His mother was his first convert and made his father sufficiently uncomfortable. They acclaimed him "Leif the Lucky"; and so he is commonly called, with great justice, to this day.

That winter there was a great buzz and stir. Eric held out in his paganism with a genial scorn for novelties, and when his wife withdrew her countenance, he determined to withdraw himself bodily, and to accompany his son Thorstein, a fine specimen of a man, if not over successful, on a voyage of exploration to this tempting new country the next spring. Eric was the very leader for the voyage, having so thoroughly done the work along 300 miles of Greenland coast and through the most forbidding water gates to the deeply

hidden pleasing dells of the inner firths. But he was thrown while riding to embarkation, with some disabling injuries, and gave up the project, averring that he saw it was not for him to discover any more land than the region where he stood.

Thorstein and his party, deprived of that wise leadership, went sailing "cheerily out of Ericsfirth in high spirits over their plan." But perhaps they started too far east or held a course too much inclined that way; for storms drove them into view of Iceland and then southward until "the birds of Ireland" met them. After months of being "driven hither and thither over the sea" they returned to Greenland discomfited. Yet they did not fare ill. Eric greeted them with a relieved chuckle, which still lingers in his Stevenson-like words: "More cheery were we when we sailed out of Ericsfirth; yet we still live; and it might have been worse." Gudrid gave Thorstein the more effective solace of her heart and hand; going with him soon afterward to a new home away up at Lysufirth, a little below the present Godthaab.

An epidemic visited their little community that winter and slew Thorstein with others. When all seemed over, the outworn young bride-widow went at last to lie down, but was awakened awfully in the blackness by a voice announcing that her dead husband had arisen in his bed and called for her. The messenger was his namesake and joint owner, Thorstein the Swarthy, overwhelmed for the moment by that most hideous of Icelandic imaginings, a belief in the evil possession or soulless revival of corpses, making these bodies of loved ones the most malignant monsters. The blackness of it must have been on her too, and far more dreadfully, yet he saw that she would go notwithstanding and bade her cross herself as one in uncanny peril. She declared her trust in God's protective goodness and went in. Then the awakening dead man, as they held him, greeted her lovingly, telling her many things close in her ear which no other heard. Soon, too, he spoke aloud for all to hear, foretelling great things in her behalf, as had the prophetess, charging them to take certain measures with a dead wizard's body for ending the pestilence and to carry himself and other victims to Ericsfirth for burial; and in especial enjoined her not to marry a Greenlander. Now this significant warning, fitting so aptly her later marriage to an Icelander, who promptly went with her to Wineland, may be considered a mere coincidence or a real cause of their adventurous effort or a touch of later art maintaining the harmonies. Perhaps the first suggestion is the least probable, but it does not greatly matter. Gudrid sailed back with her dead, a grim voyage down the rocky

and icy front of Greenland. Soon afterward her father died and she went to live with her father-in-law Eric, who took charge for her of the property that she inherited and managed it well. His own death was not so very far away.

That year two ships came out together from Iceland, one being from the eastern side, partly owned and commanded by Biarni, an historic figure; the other from the western side, belonging to Thorfinn Karlsefni, an experienced navigator and man of affairs, notable for success in his undertakings. He was prosperous, too, and able to reinforce the supply of good things very acceptably for the Yule-time entertainment at Brattahlid.

Icelanders were particular as to ancestry, and erudite in pedigree, although some of the ancestral nicknames of their records have a wild-Indian-like sound to our modern ears. Thord Horsehead, Thord the Yeller, Fiddle Mord, Biorn Chestbutter and an extravagant curiosity-shop of names developed from noses, breeches, and the like, seem more at home in the tepees of Rain-in-the-Face and Sitting Bull than as indicating eminent white men of a country which produced great literature. Omitting such uncouthness, Thorfinn Karlsefni, besides notable Danish and Norwegian lines of descent, had for father, Thord the son of Snorri, who was the son of Thord and his wife Fridgerd, daughter of Kiarval (Carroll) a "king of the Irish"—the active and formidable Cearbhall of Ossory contemporary with Alfred the Great.¹ We have already taken note of Gudrid's Gaelic descent.

It is a curious reflection that the first recorded white American was partly Celtic, both paternal and maternal. Perhaps it would be stranger were this otherwise. Iceland was Irish and otherwise Celtic to a degree rarely understood. Even the brother of the first settler brought Irish slaves with him, who revolted, leaving their name to the Westmanna (Westmen, Irishmen) islands, where they found a temporary refuge. Others were brought in afterward at every stage, perhaps the most distinguished being Melkorka,² the kidnapped daughter of another Irish "King" Kiartan (perhaps Cartan). She was bought by an Icelandic chief on the site of Bergen, Norway, passed for dumb through all the earlier years of her humiliation, but died at last, respected, in her home, the ruins of which were shown centuries afterward as "Melkorka-stead." Her grandson

¹ Eleanor Hull: *Irish Episodes of Icelandic History*. Saga Book of the Viking Club, vol. 3, p. 337.

² *Laxdæla Saga*. Proctor's transl., p. 27.

Kiartan, named for his Irish grandfather, is the most splendid figure of the *Laxdæla Saga*. In the striking hyperbole of the ancient narrative, the Gudrun who compassed his death in resentful passion and jealousy wept tears in her later days which scalded the dead out of their graves; for she had "done worst to him I loved best."

Queen Aud, the widow of the Conqueror of Dublin, brought adherents from eastern Ireland, also from Gaelic Scotland, her temporary refuge—which may possibly thus have given the most remarkable and least Scandinavian of the Eddaic poems to Iceland, as suggested by a writer in the *Encyclopedia Britannica*. Vigfusson¹ takes the same view of their general origin in the eastern islands, but without ascribing their introduction to Queen Aud,² and Bugge has presented the hypothesis again slightly modified. Her relatives and followers intermarried with most of the great Icelandic families and occupied the best lands. The names of Icelandic chieftains already given will be readily recognized as Irish. The greatest of the sagas, *Njal's*, contains a glowing tribute to King Brian Boru, as well as the most vivid account in existence of his victory at Clontarf. The sagas are thickly sown with Irish names and allusions; the *Landnamabook* displays them in almost every paragraph of a long succession; and one is tempted to think that by the opening of the eleventh century a fifth or a quarter of the Icelandic blood in all classes must have been Irish.

Thorfinn and Gudrid were married at Brattahlid after the Christmas festivities following the autumn or late summer when they first met; and they sailed for Wineland the next spring—probably that of the year 1003.

Although her influence seems to have been most active in causing and furthering this expedition, she is seldom mentioned in the saga until her return to Iceland—once as giving birth to Snorri, again as perhaps left at Straumey, while her husband went back with a party to Hóp for three months; but a woman's part in such achievements could not often be spectacular nor strike a saga-man as demanding record. The *Flateybook* saga adds a picture of Gudrid beside her infant's cradle in her palisaded Wineland home, entertaining a dubious big-eyed visitor, who bore her own name and announced approaching danger, but was invisible to all other eyes. The Indian attack followed immediately. Reeves's index calls this visitor "Gud-

¹G. Vigfusson: *Prolegomena of the Sturlunga Saga*, p. 193.

²S. Bugge: *The Home of the Eddic Poems*. Schofield's transl., Introduction. p. xxiii.

rid the Skräling woman"; but is contradicted by the items of personal appearance which are given. Some have suggested a white woman in Wineland before these Norse visitors and certainly she is described as having blonde hair and Icelandic apparel, but the prodigious eyes and invisibility seem rather to mark a non-human messenger of warning, proper to the fancy of the time. We are not told, however, that the visitation helped Gudrid or her companions in any way, for the warning came too late; so perhaps the purpose, as conceived by the saga-writer, was merely to alarm, either malignantly or as testing her constancy of mind. Whether there were any truth in this story or not, the attack seems to have been real, and one of the many ordeals through which Gudrid had to bring her little son. She saw him grow to manhood in Iceland, worthily filling his father's place after Thorfinn died.

It will be seen that this little Snorri Thorfinnson, probably born on or near Passamaquoddy Bay, is no vanishing figure of history, like pretty Virginia Dare, who came so much later to the lost colony of Roanoke, and has left us only the pathetic mystery of her fate. His descendants have been numerous in all succeeding centuries, including bishops, notable scholars, and other eminent men.

Gudrid's later career has been touched upon. It seems that she made a pilgrimage to Rome and also lived for a time the life of a religious recluse, both according to the tenets and customs of that period. She was widely known also for the aid she gave to churches, convents, and charities. At every stage of her life we find her a woman of great helpfulness, power of attraction, force of character, and upright, kindly, unsparing effort. Let us trust that this picture is as true to historic fact as to the saga-writer's ideal of a noble feminine nature.

12.—LEIF AND HIS VOYAGES

Tradition gives us likewise the year 1000 for Leif's ¹ unintended exploit, the finding of Wineland. The time is fixed also by the simultaneous conversion of Iceland in that memorable year of "the change of faith." He stands a "wise and stately" figure of history, says Dr. Fiske, but his earlier adventures were neither exalted nor generous.

Leif sailed from Greenland for Norway, perhaps early in 999, by the direct route, skipping Iceland—an unprecedented attempt,

¹G. Storm: *Studies on the Vineland Voyages*. Mémoires Société Royale des Antiquaires du Nord, 1888.

which ended for the while in his being driven on the Hebrides. He remained there a considerable time awaiting fair winds, and "became enamored of a certain woman named Thorgunna," of rare intelligence. When Leif was preparing to depart Thorgunna asked to be permitted to accompany him.

Leif enquired if she had in this the approval of her kinsman. She replied that she did not care for it. Leif responded that he did not deem it the part of wisdom to abduct so high-born a woman in a strange country, "and we so few in number." "It is by no means certain that thou shalt find this to be the better decision" said Thorgunna. "I shall put it to the proof, notwithstanding," said Leif. [Then she notified him of their expected child, adding:] "And though thou give this no heed, yet will I rear the boy, and send him to thee in Greenland, when he shall be fit to take his place with other men. And I foresee that thou wilt get as much profit from this son as is thy due from this our parting; moreover, I mean to come to Greenland myself before the end comes." Leif gave her a gold finger-ring, a Greenland wadmal mantle and a belt of walrus-tusk. This boy came to Greenland, and was called Thorgils. Leif acknowledged his paternity, and some men will have it that this Thorgils came to Iceland in the summer before the Froda-wonder. However, this Thorgils was afterwards in Greenland, and there seemed to be something not altogether natural about him before the end came. Leif and his companions sailed away from the Hebrides, and arrived in Norway in the autumn.

A Thorgunna, lately arrived in Iceland, is intimately connected with the portents of Frodis-water in the Eyrbyggja Saga—prodigies and hauntings charged to her occult power after death, and very deeply impressing the popular imagination.

Of this sorry little romance or incidental tragedy little need be said. But we get a glimmering view of the harrowed soul of the forsaken woman, which was conceived of as inflicting prodigious punishment even after death.

However, having successfully left her out of the main current of his story, "Leif went to the court of King Olaf Tryggvason, who could see that Leif was a man of great accomplishments" and promptly converted him into a zealous Christian (Leif did not, however, make amends) and at last committed to him the conversion of the other Greenlanders, at the same time that he sent the missionary Gizur on that errand to Iceland.

In the following very brief passage we have our only account of his Wineland discovery, except the notices already quoted and it is most natural that inquirers should direct all side lights on every word of it, eager to extract the full meaning. Only we should beware of a strained ingenuity, the temptation to perverse original paradox, or a too narrow and specialized view:

Leif put to sea when his ship was ready for the voyage. For a long time he was tossed about upon the ocean, and came upon lands of which he had previously no knowledge. There were self-sown wheat-fields and vines growing there. There were also those trees which are called "mausur," and of all these they took specimens. Some of the timbers were so large that they were used in building. Leif found men upon a wreck, and took them home with him, and procured quarters for them all during the winter. In this wise he showed his nobleness and goodness, since he introduced Christianity into the country, and saved the men from the wreck; and he was called Leif the Lucky ever after. Leif landed in Ericsfirth and then went home to Brattahlid; he was well received by everyone. He soon proclaimed Christianity through the land, and the Catholic faith, and announced King Olaf Tryggvason's messages to the people, telling them how much excellence and how great glory accompanied the faith.

Leif was a man with a mission now, and it held him tightly to the Greenland colony, which he probably never left again. If he built any house in Wineland, it must have been during the summer, when he was inspecting those "lands" with no thought of remaining, but in the assurance of more engrossing work elsewhere for the winter. In the warm months the ship itself or any temporary shelter would have sufficed, and if he had forgotten his duty as a vehicle of the faith in any futile burst of architecture, be sure the priest, ever at hand, would have reminded him. Presumably he did not build.

The natural meaning of "lands" would indicate several points of observation along the sea front; which seems likely with most of the summer ahead for gratifying a proper curiosity. Obviously he must have approached some part of the coast and then followed it one way or the other. It may be instructive to see what later navigators did on the same shore when similarly situated. Cabot and Hudson¹ with a hundred years and more between them, took the downward course perhaps as far as North Carolina, probably tempted by southern conditions, which were progressively more genial, then turned about northward and in the end went home. Thorfinn Karlsefni did the same, but apparently did not reach so low a latitude. We may reasonably conjecture that Leif turned southward, too. This supposition is fortified by the insistence of early geographers on a probable connection between Wineland and Africa; by Thorfinn's evident expectation of warmth and fertility; by the disappointment of his party when the facts of Straumey fell short of the imagined standard; by the adjective "Good" traditionally applied to the country, perhaps with the significance of blessed or supernally fortu-

¹ Hakluyt: *Principal Voyages* (1904), vol. 7, pp. 152, 154. Also Nansen: In *Northern Mists*; taking John Cabot on toward Cape Cod.

nate, and by the abundant grapes fit for wine, of which the Danish king told Adam of Bremen.

Now it becomes important to understand what manner of men were these enthusiastic observers of the vines and grapes. First, we have Leif himself, with abundant personal experience in all the northern countries at least, including intercourse with a king and his court, giving him a range of wider knowledge. Then the Icelanders and Greenlanders of his crew, some of whom would surely have traded, wandered, or served in arms in southern Europe. Theirs was the race that penetrated the Mediterranean to Lucca in the middle of the fifteenth century; that had overrun the vineyards of France and looted its wine-making cities; that later established itself as rulers in the two Sicilies and conquered the Canary Islands for Spain; the race that had already supplied soldiers and sailors to most countries of Europe. Miklegard (Constantinople) "the great city," the foremost center of the world's civilization for three centuries thereafter, was more familiar to their minds than it is to ours, and in a little time their men-at-arms were to be the palace-guards of its emperors. Besides these, we must remember the priest and teachers, who joined him in Norway and who were presumably not Icelandic but continental European of some kind. Further along in the saga, we find other outland ingredients, for:

It was when Leif was with King Olaf Tryggvason, and he made him proclaim Christianity to Greenland, *that the king gave him two Gaels*; the man's name was Haki, and the woman's Hækia. The king advised Leif to have recourse to these people, if he should stand in need of fleetness, for they were swifter than deer. . . . They were clad in a garment, which they called "kiafal," which was so fashioned, that it had a hood at the top, was open at the sides, was sleeveless, and was fastened between the legs with buttons and loops, while elsewhere they were naked.

This affidavit-like verbal photography and eye for costume mark the description as by the hand that drew Thorbiorg, yet it was probably only the hand of a romancer. They were afterward set to find the grapes and wheat for Karlsefni in all their semi-nude picturesqueness. I have elsewhere repeatedly indicated a belief that this story as presented is worse than apocryphal.

No doubt both Tyrker of the Flatey saga and this Haki have an aggressively mythical air. The Wineland products no doubt impressed popular fancy and may have seemed to call for special distinction in the matter of their finding; but whether both or either of these stories be accurate, or wholly invented, or relate to matters of fact ill understood, they reveal a general knowledge that these early

crews were not all of one nation, and a sense that the discovery of grapes in particular would probably be made by foreigners among them.

Professor Fernald¹ suggests that wild currants or more probably rock-cranberries and not grapes were found, awakening the widespread and long continued interest already stated. In support of this hypothesis, he cites Linnaeus, a better authority on botany than on vintages as holding "currant-wine" equal to the real article, if only you add a little sugar. Prof. Fernald says that rock-cranberries are a great treat to the birds of Labrador. He believes that the Norsemen, coming from Greenland, were delighted with their profusion and went no farther. Now I do not know what sort of wine may be made from cranberries, but the prospect is unpleasing. It is true enough that beverages with hyphenated names are evolved in divers rural districts and old fashioned households from currants, elderberries, blackberries, wild cherries and the like; and some people have experienced them. Every such name, for example gooseberry-wine, testifies to the pre-existence of real wine as a standard, and to the fact of feeble imitation. Are these the fruits from which the stout Danish king declared "the best of wine" could be made? Can we imagine these Icelandic broadswordsmen in armor growing ecstatic over the prospect of berry decoctions? Would it have been possible, even in later and milder days, to have sustained on them the "true vinous enthusiasm" which Dr. Saintsbury celebrates and which roared through "the tumultuous choruses of Headlong Hall"? Professor Fernald observes the phenomenon too much through the spectacles of the dry-leaf collector and specimen man, omitting the greater part of eleventh century Norse human nature. These men of Greenland and Iceland were after intoxicants. Furthermore, the Ericsfirth region was a berry-country, no less than Labrador. Even 250 miles farther up the coast, Davis² found red-currants growing wild near the end of the sixteenth century, and Dr. Rink³ attests the great practical value to the inhabitants of the crowberry-crop in southern Greenland at the end of the nineteenth century. He says that the cowberries though plentiful are not eaten. It is not at all believable that men should sail out of one profusion of small fruit into another,⁴ like in kind, but inferior and despised at home, and trumpet their experience abroad as something wonderful.

¹ The Plants of Wineland. Rhodora, Feb. 1910.

² The Voyages and Works of John Davis, edited by A. H. Markham, 1880.

³ H. J. Rink: Danish Greenland, pp. 86, 88.

⁴ Nansen, in stating this, seems to have confused crowberries with cowberries, but his argument is sound.

Nor do we find to-day any tendency among our people to confound berries with fox-grapes in fact or in name. The mere difference in size of fruit surely ought to be safeguard enough, to say nothing of the really preposterous contrast between the plants in the same regard. This grape is larger than most of the cultivated ones on the market, whereas currants and cowberries are but little things. The wild grape-vines will sometimes have a stem diameter of six inches and often run to the upper boughs of tall trees or overspread those of somewhat lesser growth with a dense canopy of verdure; but we all know what currant-bushes are, and the other suggested competitors hardly equal their size. Would the old Norsemen have felt any close analogy between a fruit as big as a pea, growing on a small shrub and another as large as a pigeon's egg, hanging from a conspicuous feature of the woodlands? Their descendants among us do not seem to observe such matters differently from other people.

Among Dr. Storm's notes there is one curious instance of a Nova Scotian, who referred to certain grapes as "wine-berries." I take this to relate to our common tart squirrel-grape, about the size of a Zante-currant and barely edible when quite ripe, though chiefly useful for jelly, and presumably capable of yielding a berry-wine or other dubious beverage. Dr. Storm's witnesses probably establish the occasional occurrence of this little wild grape in Nova Scotia a few years ago, if not now; but no doubt Prof. Fernald is right in holding that it cannot have been plentiful. Yet, however abundant, it would be irrelevant. Not such were the bountiful grapes which King Sweyn commended to Adam of Bremen, which the sagas celebrated, and which Leif Ericsson first found.

The larger wild grapes, it appears, are divided into several species of varying habitat in New England, nowhere passing the Bay of Fundy. Gomez¹ may have found them on the Penobscot about 1525, as Champlain heard of them in 1605 on the St. John, where they have been made into wine in recent years,² and reported them plentiful near Saco. Lescarbot,³ who was with him, corroborates this, declaring that they grew as large as plums at Richmond Island; but he relates a projected experiment of their apothecary to introduce grape

¹ S. E. Dawson: *The St. Lawrence, its Basin*, p. 102.

² Haliburton: *A Search for Lost Colonies*. *Pop. Sci. Mo.*, vol. 26, p. 40.

³ M. Lescarbot: *Nova Francia*. Erondelle's transl., pp. 93, 101. I have mistaken one of our small wild plums for such a grape, the tree and vine being neighbors.

vines from southern New England and plant them at Port Royal, Nova Scotia, where they did not grow.¹

Strachey² celebrated these grapes in the same vein as the King of Denmark, but more voluminously, during the time of Powhatan's confederacy, "the Queen of Portobaco," "the Emperor of the Nanticokes" and "the laughing King of Accomac." He writes:

It would surely raise a well-stayed judgment into wonder (as Sir Thomas Dale hath writ sometime unto his majesty's counsel here for Virginia) to behold the goodly vines burthening every neighbor bush and climbing the tops of highest trees and these full of clusters of grapes in their kind, however draped and shaded soever from the sun and though never pruned nor manured. I dare say it that we have eaten there *as full and luscious a grape as in the villages between Paris and Amiens and have drunk often of the rath wine which Dr. Bohune and other of our people have made full as good as your French British wines.* Twenty gallons at one time have sometimes been made, without any other help than crushing the grapes in the hand, which letting to settle five or six days hath in the drawing forth proved strong and heady.

This would seem to dispose of Dr. Nansen's suggestion that Leif and others had neither appliances nor leisure for wine-making.

Possibly, like the Norsemen, the Virginians overrated this vintage. It is more to the purpose to note the effect of these wine-yielding wild-grapes on the minds of early explorers and colonizers; and that, with so many centuries between them, both apply the same praise to the same thing. "Strong and heady" no doubt had much to do with the excellence ascribed.

These grapes are especially important to our present research, not only because they gave North America its first name (unless we except the more dubious Great Ireland) but because they are our best clew to one of the "lands" that Leif discovered. Being first or last where fox grapes were abundant, he must have reached southern New England at least, more likely New Jersey, or even the regions about the Chesapeake. Remembering Cabot and Hudson

¹ Leif's crew, like our people of the District of Columbia and neighboring states, doubtless did not discriminate, except between the small berry-like kind (which would not be highly valued where better berries were plentiful) and the large kind, good for table-fruit and for wine. We call the latter "fox grapes." I have picked and eaten them on a low island of the Anacostia near Benning's bridge, and only a few feet from a great bed of wild rice, a spot probably within the limits of Washington City. More commonly they occur on our hills. A few years ago a great number were gathered near the Conduit Road for our household use. Civilization clears them away; yet I have found them, both green and ripe, near the lower reservoir in a dense thicket on two occasions in August, 1911.

² W. Strachey: *The Historie of Travaile into Virginia*, p. 120.

and the reference to "Africa," my own probable limit for him would be more southerly even than Norfolk, though it is all conjecture. Juul Dieserud was perhaps the first writer to point out the probability that Leif had gone farther south than Thorfinn, though Moulton's History of New York had carried Thorvald to Manhattan or beyond it. The account of the shore westward beyond Leif's-booths in the Thorvald section of the Flateybook saga undoubtedly suggests the outer face of Long Island, N. Y., or some like low strand—possibly a reminiscence of Leif's earlier cursory visit to the coast.

Of course we must not forget that the range of a plant may change with time, a lowering or rising of the average temperature being an important factor in determining this. Indeed, in the case of the squirrel-grape a withdrawal from Nova Scotia seems to have really occurred within a hundred years. But the disappearance may be due to their sparseness and to human interference in clearing ground, rather than to a very few feet of crustal uplift or other change in conditions. During the previous 800 years, man would not be a factor, for the Indians of the region were not agricultural nor likely to work, except in fishing and hunting, beyond the absolute needs of their canoes and camp-fires. The seasons, too, during the last 300 years appear pretty constant in quality, except where modified a little by shearing off the forests. The few weather hints of the earlier Norse sagas tell the same story of relative temperature north and south, although the upper border of the grape-belt may have receded a little.

One might fancy that the increasing severity in Greenland's climate, which Ivar Bardsen noted about midway between our time and that of Eric the Red (though Dr. Nansen doubts it), would necessarily be repeated along our coast from Labrador to Cape Ann, by reason of the augmented volume and coldness of the southward-running Arctic current. But the problem is not so simple, for a mild Greenland season has been found to make a chill one in Labrador, as Dr. Fiske¹ has noted, by loosening a greater mass of ice from its moorings to float southward. On the whole, we may more safely assume approximately the same climate as at present and the same area of abundance for fox-grapes in the year 1000 until we have some proof of change.

The "wild wheat" of the saga will be dealt with more fully in a later chapter. If construed as "strand oats," for example by Prof. Fernald, it clearly contradicts the statements about grapes

¹ The Discovery of America.

and vines and excellent wine, since it confines us to northern regions which they cannot reach. If it means *Zea mays*, our ordinary "corn," as believed by Rafn and Fiske, it can add nothing, for the maize limits and fox grape limits were nearly identical on the northeast, and both extended southward far beyond any probable voyage of Leif. If, as appears most likely, wild rice (*Zizania aquatica*) be intended, our case for local identification is only a little better. This rice grows plentifully all the way from Texas to the coast mountains of Maine; it is so plentiful in Maryland as to be the dominant feature of river landscape in the tidewater region; it thrives near Boston and Providence. Indeed, Cartier's attention in 1535 was attracted to it (as blé sauvage) on the southern shore of the Gulf of St. Lawrence. As already stated he says it is like rye, and plainly distinguishes between it and maize, which he first saw soon afterward. Leif might have found wild rice at intervals anywhere below the Kennebec.

The statement that *some* of the timbers were large enough to be used for building may seem to imply a lightly timbered region, but Leif merely took "specimens," and the word "some" doubtless relates to this little miscellaneous collection and not to the general forestry of Wineland or Markland. The use referred to would probably be at Brattahlid, or at least under the direction of Eric,¹ whose ideas on such subjects were massive, as we gather from the hundred-cubic-foot dimensions of his house-wall stones. Growing trees of any reasonable bulk and height might readily have been found within the limits of the present Maritime Provinces; and Newfoundland must have been mainly a forest, as were most of the seaboard regions below.

There has been much discussion over the puzzling "mausur wood." Rafn thought it especially indicated "bird's-eye maple," found on Marthas Vineyard and elsewhere. This is probably our most beautiful native wood, having a delicate wavy and dotted grain. Prof. Fernald in his *Rhodora* article identifies mausur positively with "canoe birch." In Scandinavia some kind of birch must have been most often the source of this ornamental carving wood, for birches are the most plentiful hardwood trees of northern countries. Yet on Grand Manan, where the white birch is everywhere in evidence, the comparatively few maples would more readily yield a large specimen; and knotty parts are to be found in either. That "a veined wood," irrespective of species, is the real meaning appears from the following words of said article: "Similar growths have sometimes been found on the maple, horse-chestnut, cherry and aspen, and *have*

¹ H. J. Rink: Danish Greenland. Stated as 6 feet by 4 and "of like thickness."

sometimes been put to similar use." It is hard to believe that any birch, however contorted in grain, can equal bird's-eye maple; but no doubt these practical lovers of beautiful things were in no way concerned as to whether it were one or the other, provided it answered their requirements. They would classify by ornamental effect, and name it according to their classifying. But even if we were to accept canoe birch as the true and only "mausur," Leif might still have obtained it almost anywhere from Long Island to Nova Scotia. Besides, we do not know that he cut his prize in the same "land" where he gathered grapes. He visited "lands" and brought home these specimens; that is all.

We have no further clue. He touched a country of warmth and plenty, where wild fox-grapes abounded. The other products which he found were proper to that territory, although they may have been picked up beyond it. From allusions later in the saga, and statements elsewhere, we learn that he named this region Wineland, but not necessarily with any reference to goodness or blessedness except so far as he may have held wine to be good and blest.

Dr. Nansen discredits this achievement of Leif, though accepting the saga's previous statement that he sailed from Greenland directly to the Hebrides and Norway, and applauding it as among the greatest of nautical exploits. But surely this bold navigator would be the very man to attempt a repetition of the feat, sailing the other way; and what could be more natural than his storm-driven landfall on an unexpected shore? We do not need to go into mythology or folk-tales for precedents; such incidents are there also because they first happened to men in reality; and they keep on happening. When that which began as fact occurs as fact again, it cannot reasonably be impeached by any intervening or parallel play of fancy.

Leif's items are meager, but so far as they go they are absolutely corroborative. Evidently someone visited our coast somewhere between Casco Bay and the Chesapeake, touching also at Newfoundland and Labrador. Whether the voyager were Leif, or Biarni, or another may not be practically important, but Leif is named as discoverer in the best accredited saga, and we may as well adhere to him until a more plausible candidate is found.

13.—WITH THORFINN AND GUDRID TO THE BAY OF FUNDY

A glance at a map of these regions shows two methods of approach to mainland America from southern Greenland—the direct route over sea and the slow but nearly safe and sure northwestern journey along

the Greenland coast to the region where the shores bend toward each other near Davis Strait; followed by a dash southward or southwestward. The former aims immediately at habitable regions and pleasant surroundings; it is shorter and naturally tempted men; but it tempted the rage of the Atlantic also, which has usually been active near the Newfoundland banks and above them, providing a dangerous trap for mariners who had to guess at direction since they carried no compass. It sent Thorstein, through great trouble and hardship, all over the sea to no purpose. Very likely it sent Bishop Eric and his companions to the bottom, destroying with them all hope of a Christianized and organized Wineland.

Thorfinn Karlsefni, though an enterprising man, probably owed his especial reputation for success to his very great care in making sure. Like all such, he had the wit to profit by the mistakes of others. He was a seasoned navigator who had thus far avoided mishap, through knowing how to humor the northern seas. Moreover, in Red Eric he had the counsel of the foremost explorer in the world, who must have pondered long on the causes of his son Thorstein's failure and the best way to avoid its repetition in trying again. If he had not seen—as already suggested—the main American shore opposite Greenland in the course of his first very thorough three years' explorations, his indomitable wilderness-rangers like Thorhall the hunter, must surely have been frequently up about the straits and would be charged season after season to bring him information. So active a mind as Eric's anchored physically by increasing years and injuries, could not fail to busy itself especially with the geography of the lands beyond that water and their relation to those which Leif had seen. The coming of driftwood to him from some unknown quarter would be a continual reminder and incitement. Thorstein was dead, Leif was immersed in aggressive Christianity; in his brilliant daughter-in-law Gudrid, her husband and Leif's brother, Thorvald, Eric the explorer would naturally see the best hope of substituting success for failure.

Thorfinn's actual route is carefully given. It was from Ericsfirth to Gudrid's former home near Lysufirth in the smaller settlement; about five degrees farther west and a long distance above the junction of the western water with the Atlantic. Next they went to "Bear-Island," according to the Saga of Thorfinn Karlsefni, or "the Bear Islands," according to the Saga of Eric the Red, which is generally the safer guide where details differ. No doubt Disco was called "Bear-Island" (Biarney), as Graah,¹ the first official explorer of

¹ Exploration of the East Coast of Greenland, before cited.

Eastern Greenland, pointed out nearly a century ago. But this was a common name, readily applied; indeed our narrative presents later another and very distant Biarney. Disco is unreasonably far north, involving unnecessary struggles with icy currents; and the flight from it could hardly have been made in the time given by the sagas, though perhaps this item need not be insisted on. An island,¹ off Baffin-land, on the American shore has been suggested, bidding us assume not only that this coast had been seen, as it may have been, but that it had grown familiar enough for recognized nomenclature in details. We have no warrant to go so far. A more moderate conjecture points to the Greenland islands near the present Godthaab, where Davis was attacked by Eskimo nearly six centuries afterward. They would make a good taking-off point. It was only necessary to await a strong steady wind from the north. Having this behind them, like migratory birds of long travel, Karlsefni and his company sped down "southward," or a little west of southward, on their way.

One hundred and sixty men and several women besides Gudrid went with him—perhaps children, too, as did Snorri in returning—for families took all manner of chances in those reckless days. "All kinds of live stock" owned by Greenlanders accompanied these colonists in three, or possibly four, large vessels. Clearly they intended permanent settlement.

We must not call them viking-ships, which never sailed out of Iceland or Greenland; though Dr. Fiske² inadvertently styles Eric the Red "a viking," in praising his explorations, and Colonel Higginson³ devotes much space to an account of Norse marauders, to make us acquainted with the people who tried at great risk and through much hardship to settle America. The only enlightenment is collateral, and the general effect is misleading.

Such utterances grow out of a confusion like that between sea-king and viking, which gives the first syllable of the latter its broad current mispronunciation. Three types must be distinguished: the sea-king, the viking and the settled man of the north who created what prosperity was going and offered the best hope for the future. The first—for example Olaf the White Queen Aud's husband—made conquests by his navy, and differed from other navy-wielders only in

¹ J. T. Smith: *The Discovery of America by the Norsemen in the Tenth Century*. Also the Minn. Hist. Soc. Report, already cited p. 13. (His map with additions.)

² *The Discovery of America*.

³ Higginson and MacDonald: *History of the United States*. Ed. 1905, pp. 25 *et seq.*

being less definitely anchored politically and more ready to drop anchor permanently abroad. The second was a predatory son of the vik or fiord (as his name tells us) in which he had his den, and whence he issued, to pounce on passing ships or harry the farmers along the shore.

If these things were done far afield, men counted them acts of war against the outer world and the perpetrators were considered heroes. Many generally commendable Scandinavians engaged in them. Sometimes even formidable associations were organized, to more efficiently exploit this wide opportunity. But excitement and yet more the prospect of booty were at the bottom of it all. In proportion as the achievements occurred nearer home, they were regarded with more disfavor. Especially was this true in that northern island which was colonized by picked men choosing exile rather than submission, whose natures also were modified from the beginning by other blood of more ripe and gracious culture. The home-raider was held not wholly admirable in Norway; he became in Iceland (see *Landnama*) "the most wrongful of men" and "a viking and a scoundrel." Just so, Ospak¹ of the northern Ere and his merry men, owned a lieutenant, one Raven, adequately stigmatized in another great saga as "by named the viking, he was nought but an evil doer." There is no compromise in the characterization of such folk by the early heroic literature. The teaching is often by example rather than precept, by dramatic exhibition rather than denunciation; but we are expected to feel that the boiling alive² of professional bullies might be overlooked, if not applauded, and that almost the very worst type of man was he who brutally afflicted his neighbors, and thus acquired their wives and goods. To the Iclander, if there were one kind of robberbully more intolerable than another, it was the local amphibious viking. Rather early in the prosperity of the island, it necessarily made an end of him. But that "viking" should be anything but a synonym for aquatic hero in these northern lands hardly seems to have suggested itself to most English-writing historians. The sea-king and the viking were the greater nuisance and the less of their period; but there was this to be said for the former, that he revived in some form the order which he overturned and often was a factor in improvement, whereas the viking was merely destructive, except in his own home or within the limits of his predatory association.

¹ The Eyrbyggja Saga. Morris and Magnusson's transl., pp. 164, 291. Notes.

² Eyrbyggja Saga, p. 70.

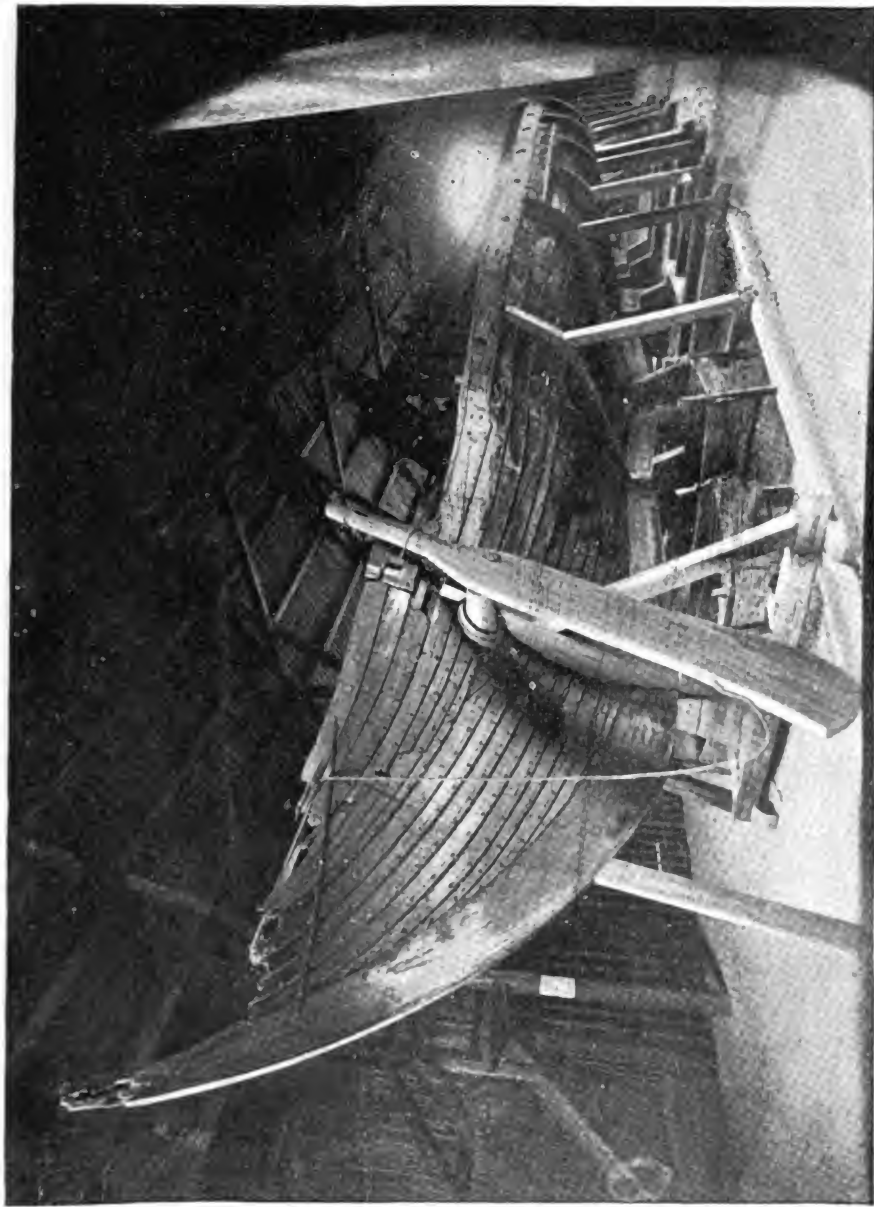
The normal Norseman, of whom we hear less, was a good man at arms, under penalty of losing all; too ready, no doubt, to obey the battle summons even in the neighborhood or family quarrels; but less a soldier than a trader, a farmer, a fisherman or something of all three, as well as a curious traveler abroad. At heart he was anything but a pirate. The habit of industry was almost curiously dominant in all classes and exhibited in the most artless, unpretending way. The great chief and champion Gunnar is discovered sowing grain with his own hands in the crisis of his fate; at Bolli's command, his wife Gudrun goes out of the dairy, where murder is to leap on him, and providently washes clothes in the brook during that tragedy; the vengeance of Bardi falls on Gisli and his companions while their scythes are asway in the field; Hallgerda's first husband is killed, by her contrivance, over a quarrel as to whether he or another can best handle codfish; and the whole troop of Flosi the Burner postpone one of the most notable recorded instances of Norse vengeance until they have properly completed the haying. The old time Iclander was a very practical, if a very belligerent and litigious, hero, with genuine honesty as he saw it, and a real intention to be law-abiding in the main, though abiding a most topsy-turvy kind of law.

Yet, while not a viking, he might have as good ships or better. Such were the "dragons" or "serpents," built for dangerous hazards and important missions, for withstanding the worst onset of the elements—at need for hand to hand boarding with sword and axe and spear, also for the most effective pursuit or escape.

Of course they were not the only kind. A rather clumsy and dilatory craft¹ was in use more or less for ordinary trading purposes. Its modern representative was pointed out to Professor Packard² by a Norwegian, and taken as an approximate standard in the sailing calculations of the former for the time needed in the passage between Newfoundland and Greenland across the dreaded Ginnungagap. But one of the exploring vessels had already borne Thorbiorn and Gudrid with their fortunes to Greenland, when a dismal death, or life, honor and prosperity, were in the cast of a die, and all that he owned had gone to the venture; a second was Thorfinn's own; a third belonged to Biarni, a chivalric chieftain of the highest personal pride and most exacting followers. Such craft would more likely be of the dragon or serpent pattern, beautiful open ships "which were probably stronger and more seaworthy and certainly much swifter than the

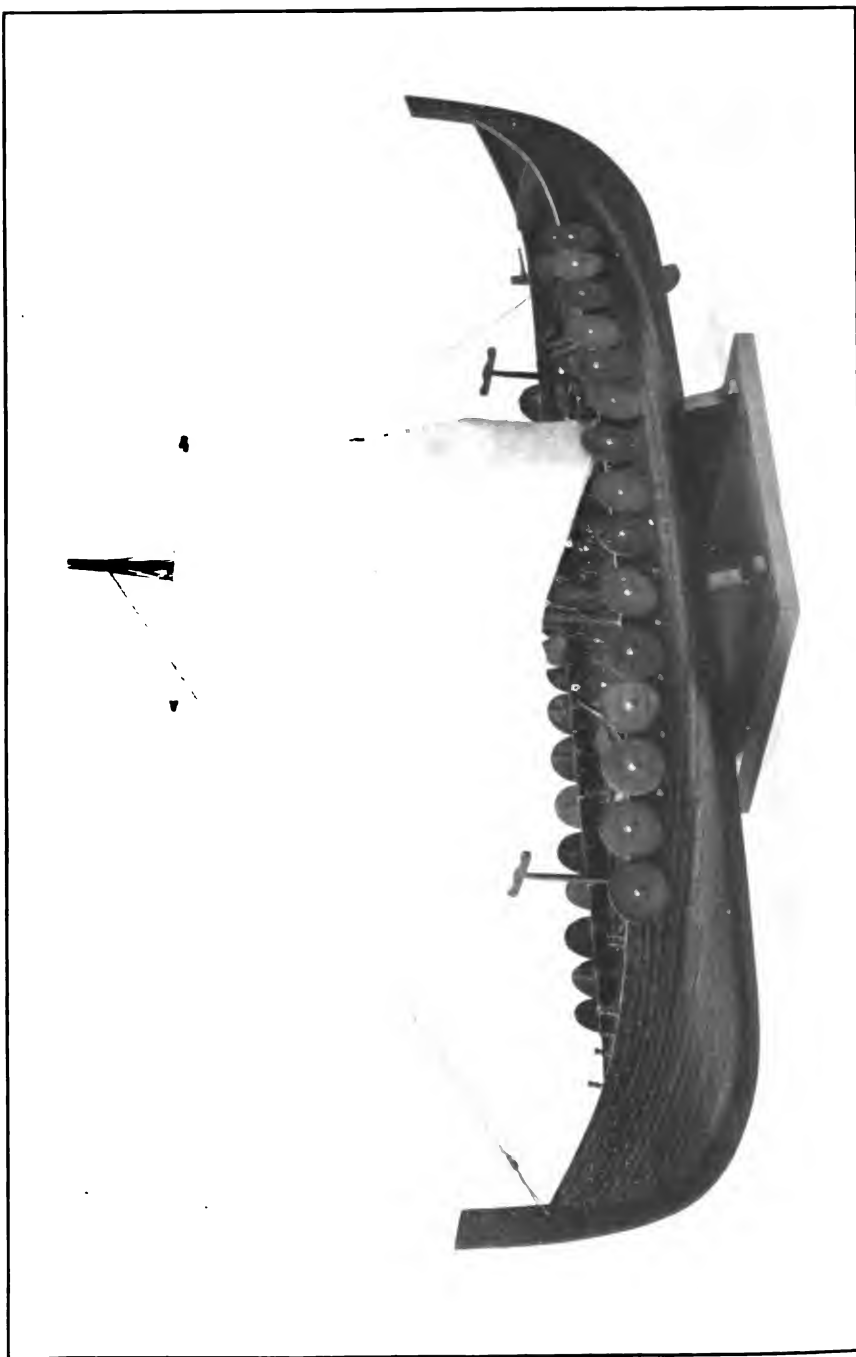
¹ Heimskringla. Laing's transl., vol. 1, p. 441.

² A. S. Packard: The Labrador Coast, pp. 24, 26.



THE GOKSTAD SHIP, STERN VIEW

From photograph taken in Christiania, Norway. Belongs to period from 700 to 1050 A. D. Discovered in the "King's Mound," near Sandefjord, Norway, in 1880. Dimensions of original: keel 66 feet, length over all 79 feet 4 inches, breadth 16½ feet, depth 6 feet in middle, 8½ feet at extremities. For description and other illustrations of the Gokstad ship see Smithsonian Report (National Museum), 1891



MODEL OF THE GOKSTAD SHIP IN U. S. NATIONAL MUSEUM

Spanish vessels of the time of Columbus." Laing¹ gives similar testimony. One of the largest on record was King Olaf's Great Serpent, a hundred and fifty feet in the keel.

Colonel Higginson² has described this type, from a fine specimen yielded up nearly intact by the northern sands. I quote only a little:

She was seventy-seven feet eleven inches at the greatest length and sixteen feet eleven inches at the greatest width . . . and would draw less than four feet of water. . . . As a whole this disinterred vessel proved to be anything but the rude and primitive craft which might have been expected. It was neatly built and well preserved, constructed on what a sailor would call beautiful lines and eminently fitted for sea-service. . . . Many such vessels may be found depicted on the celebrated Bayeux tapestry. . . . This was not one of the very largest ships, for some of them had thirty oars on each side (instead of its sixteen) and vessels carrying from twenty to twenty-five were not uncommon. . . . Probably the sail was much like those still carried by large open boats in that country, a single square on a mast forty feet long.

Thus equipped, Thorfinn could go quite literally on the wings of the wind. Henceforward, at least as far as the Bay of Fundy, we have the benefit of their log and sailing directions. Leif has given us no such aid, but there was no such motive in his case. He had stumbled on his great good fortune, and probably acted mainly from impulse in skirting the shore awhile, and touching here and there for specimens, before hurrying home to evangelize Greenland. Thorfinn, however, aimed at permanency, and it was most important to note closely the route which must be retraced in sending tidings and establishing communication with the parent colony, and which all reinforcements must follow. It is plain sailing in the saga as in reality, with merely some uncertainty as to the exact intervals of time and distance intended. In that the swiftness of the wind-driven ships of course must be considered.

The saga tells us:

Thence they sailed away beyond the Bear Isles with northerly winds. They were out two *doegr*; then they discovered land, and rowed thither in boats, and explored the country, and found there many flat stones [*hellur*], so large, that two men could well spurn soles upon them [*i. e.*, lie at full length upon them sole to sole]; there were many Arctic foxes there. They gave a name to the country and called it *Helluland*.

Thence they sailed two "*doegr*," and bore away from the south toward the south-east and they found a wooded country and on it many animals; an island lay there off the land toward the south-east; they killed a bear on this, and called it afterwards *Biarney* [Bear Isle]; but the country *Markland* [Forest-land]. When two "*doegr*" had elapsed, they descried land, and they sailed off this land; there was a cape [*ness*] to which they came. They beat into the wind along this coast, having the land upon the starboard [right] side. This

¹ *Heimskringla*, Laing's Introduction, vol. 1, p. 160.

² Higginson and MacDonald: *History of the United States* Ed. 1905, pp. 30 *et seq.*

was a bleak coast, with long and sandy shores. They went ashore in boats, and found the keel of a ship, so they called it Keelness there; they likewise gave a name to the strands and called them Furdustrandir (Wonder Strands), because they were so long to sail by. Then the country became ¹ fiord-cut and they steered their ships into a bay.²

Here the interpolated unauthentic episode of Haki and Hækia occurs. "One of them carried in the hand a bunch of grapes, the other wheat selfsown. Karlsefni said they seemed to have found goodly indigenous products." The original narrative proceeds, beginning with a repetition which is enough of itself to show the break made by the foreign matter:

Karlsefni and his followers held on their way, until they came where the coast was fiord-cut (or indented with bays). They stood into a bay with their ships. There was an island out at the mouth of the bay, about which there were strong currents, wherefore they called it Straumey [stream island]. There were so many eider ducks ["birds," Thorfinn Karlsefni] ³ on the island that it was scarcely possible to walk for the eggs. They sailed through the firth, and called it Straumfiord [stream firth] and carried their cargoes ashore from the ships, and established themselves there. . . . There were mountains there and the country round about was fair to look upon. They did nought but explore the country. There was tall grass there. They remained there during the winter, and they had a hard winter, for which they had not prepared, and they grew short of food, and the fishing fell off. Then they went out to the island, in the hope that something might be forthcoming in the way of fishing or flotsam. There was little food left, however, although their live-stock fared well there [i. e., on the island]. Then they invoked God, that he might send them food, but they did not get response so soon as they needed. Thorhall disappeared. They searched for him three half days and on the fourth day Karlsefni and Biarni found him on a projecting crag [note, of the island]. He was lying there and looking up at the sky, with his eyes, nostrils and mouth wide-stretched, and was scratching himself, and muttering something. They asked him why he had gone thither; he replied that it did not concern any one; he told them not to be surprised at this; adding that he had lived sufficiently long to render it unnecessary for them to take counsel for him. They asked him then to go home with them and he did so. Soon after this a whale appeared there, and they went to it, and flensed it, and no one could tell what manner of whale it was. Karlsefni had much knowledge of whales, but he did not know this one. When the cooks had prepared it, they ate of it, and were all made ill by it. Then Thorhall, approaching them, says: "Did not the Red-beard prove more helpful than your Christ? This is my

¹ Olson substitutes "fiord-cut," as more exact, for Reeves' "indented with bays."

² A. M. Reeves: *The Finding of Wineland the Good*, pp. 42-43.

³ Compare Bird Island of the Gulf of St. Lawrence, where Packard in 1864 found the whole top white with nesting birds. In 1860 about 50,000 pairs of gannets nested there, 5,000 in 1874; 50 in 1882, and their nests had been rifled when found. Funk Island off Newfoundland on the Atlantic side was also often called Bird Island for like reasons.

reward for the verses which I composed to Thor the Trustworthy; seldom has he failed me"; and when the people knew this, none of them would eat, and they cast [it] down over the rocks, and invoked God's mercy. The weather then improved, and they were able to row out to fish, and they had no longer any lack of the necessities of life. In the spring they went into Straumfirth and obtained provisions from both regions, hunting on the mainland, gathering eggs, and deep-sea fishing.

Now they took counsel together concerning their expedition, and came to an agreement. Thorhall the Huntsman wished to go northward around Wonderstrands and past Keelness, and to seek Wineland; while Karlsefni wished to proceed southward along the land and *to the eastward*, believing that country to be greater, which is farther to the southward, and it seemed to him more advisable to explore both. Thorhall prepared for his voyage out below the island, having only nine men in his party, for all of the remainder of his company went with Karlsefni.

Of this picturesque dissident and minority-leader we hear earlier in the saga:

Thorhall was called the Huntsman; he had long lived with Eric, engaging in fishing and hunting expeditions during the summer, and had many things under his charge. Thorhall was a man of great stature, swart and giant-like; he was rather stricken with years, overbearing in manner, taciturn, and usually a man of few words, underhanded in his dealings, and yet given to offensive language, and always ready to stir up evil; he had given little heed to the true faith after its introduction into Greenland. Thorhall was not very popular, but Eric had long been accustomed to seek his advice. He was in the same ship with Thorvald and his companions because he had extensive knowledge of the uninhabited regions.

Continuing the narrative:

And one day when Thorhall was carrying water aboard the ship, and was drinking, he recited this ditty:¹

"When I came, these brave men told me,
Here the best of drink I'd get,
Now with water-pail behold me,—
Wine and I are strangers yet.
Stooping at the spring, I've tested
All the wine this land affords;
Of its vaunted charms divested,
Poor indeed are its rewards."

Then they put to sea and Karlsefni accompanies them out off the island. Before they hoisted sail, Thorhall recited this ditty:

"Comrades, let us now be faring
Homeward to our own again!
Let us try the sea-steed's daring,
Give the chafing courser rein.
Those who will may bide in quiet,
Let them praise their chosen land,
Fasting on a whale-steak diet,
In their home of Wonder-strand."

¹A. M. Reeves: The Finding of Wineland the Good.

Then he "sailed away to the northward past Wonderstrands and Keelness, intending to cruise to the westward around that cape." No more was heard of him, until, after their return to Iceland, traders brought word that he had been enslaved in Ireland, where he is said to have died. Storms were given the credit of causing this unexpected and rather prodigious and disastrous journey; but perhaps he had taken the opportunity to withdraw with a ship from westward lands altogether.

To offset this defection, the baby Snorri had arrived as a little reinforcement, his birth-place being apparently the shore of the bay behind Straumey, before they moved out to that island in the winter: for we are told later that "Snorri, Karlsefni's son was born the first autumn and was three winters old when they (finally) went away." He may have been about six months old when the party divided, and "Karlsefni cruised southward off the coast with Snorri and Biarni and their people."

No doubt there was hope of establishing their home permanently in some spot which would better fulfill the expectations aroused by Leif. The absence lasted however, only a year; making an episode presenting so many special problems that it must be treated separately.

Returning from this southern sojourn:

They now arrived again at Streamfirth where they found great abundance of all those things of which they stood in need. Some men say, that Biarni and Gudrid remained behind there with a hundred men, and went no further; while Karlsefni and Snorri proceeded to the southward with forty men, tarrying at Hóp barely two months and returning again the same summer. Karlsefni then set out with one ship, in search of Thorhall and Huntsman, but the greater part of the company remained behind. They sailed to the northward around Keelness, and then bore to the westward, having land to the larboard [left]. There were wooded wildernesses there; and when they had journeyed a considerable distance, a river flowed down from the east toward the west. They sailed into the mouth of the river, and lay to by the southern bank.

It happened one morning, that Karlsefni and his companions discovered in an open space in the woods above them, a speck, which seemed to shine toward them, and they shouted at it: it stirred, and it was a Uniped¹ [onefooter], who skipped down to the bank of the river by which they were lying. Thorvald, a son of Eric the Red, was sitting at the helm, and the Uniped shot an arrow into his inwards. Thorvald drew out the arrow and exclaimed: "There is fat around my paunch; we have hit upon a fruitful country, and yet we are

¹ Nansen: In Northern Mists; contains a picture of a harmless-looking one copied from the well-known Hereford map. The fancy may have come from the south; but Norsemen were ready to see Unipeds even in Scandinavia on slight provocation—much more on an inner shore of a land of mystery and dread.

not likely to get much profit of it." Thorvald died soon after from his wound. Then the Uniped ran away back toward the north. Karlsefni and his men pursued him, and saw him from time to time and it seemed as if he were trying to escape. The last they saw of him, he ran down into a creek. Then they turned back; whereupon one of the men recited this ditty:

"Eager, our men, up hill down dell,
Hunted a Uniped;
Hearken, Karlsefni, while they tell
How swift the quarry fled!"

Then they sailed away back toward the north, and believed they had got sight of the land of the Unipeds; nor were they disposed to risk the lives of their men any longer. They concluded that the mountains of Hóp, and those which they had now found, formed one chain, and this appeared to be so because they were about an equal distance removed from Straumfiord in either direction. They intended to explore all the mountains, those which were at Hóp and those which they discovered. They sailed back and passed the third winter at Straumfiord.

Then the men began to grow quarrelsome, of which the women were the cause; and those who were without wives, endeavored to seize upon the wives of those who were married, whence the greatest trouble arose.

When they sailed away from Wineland, they had a southerly wind, and so came upon Markland, where they found five Skrellings, of whom one was bearded, two were women, and two were children. Karlsefni and his people took the boys, but the others escaped, and these Skrellings sank down into the earth. They bore the lads away with them, and taught them to speak, and they were baptized. They said, that their mother's name was Vætildi, and their father's Uvægi. They said, that kings governed the land of the Skrellings, one of whom was called Avalldamon, and the other Valldidida. They stated, that there were no houses there, and that the people lived in caves or holes.

Then follows the information before mentioned about a possible Ireland the Great; also the statement of their return to Greenland; where they passed the winter, going on to Iceland the next season.

The little epic pendant of Biarni's death, the experience of Gudrid with her mother-in-law, and the genealogy of "Herra Hauk the Lawman" end the saga.

Dr. Nansen has noticed the insertion of The Gaelic Runners episode in the wrong place, but apparently misses the significance of the words about entering a bay which precede and follow it. Evidently there was but one bay, repeated by the interpolator to keep up the story or in mere carelessness. These were intending settlers guided by Eric's advice and plan of penetrating deep inlets and establishing themselves in fertile, ample, grassy borders. Passamaquoddy Bay, just beyond Grand Manan, would be the first to tempt them one would say.

14.—THEIR WINELAND VOYAGE INTERPRETED

Some romantic matter concerning Thorhall, Thorvald, and Markland—which may well be quite true in substance yet should not be treated as historic—has been given above, not only because it is threaded on the very coherent and sensible explorers' narrative in the saga and has a certain literary interest, but because of its helpful data.

We see that this narrative deals with wide intervals, great areas, impressive features of the coast, and prodigious phenomena, ignoring minor items, except for identification or incidental entertainment. Again, wherever the explorers follow the coast for any great distance, its notable characteristics are carefully given; so, when these do not appear, we may be sure they sailed out of clear sight of land.

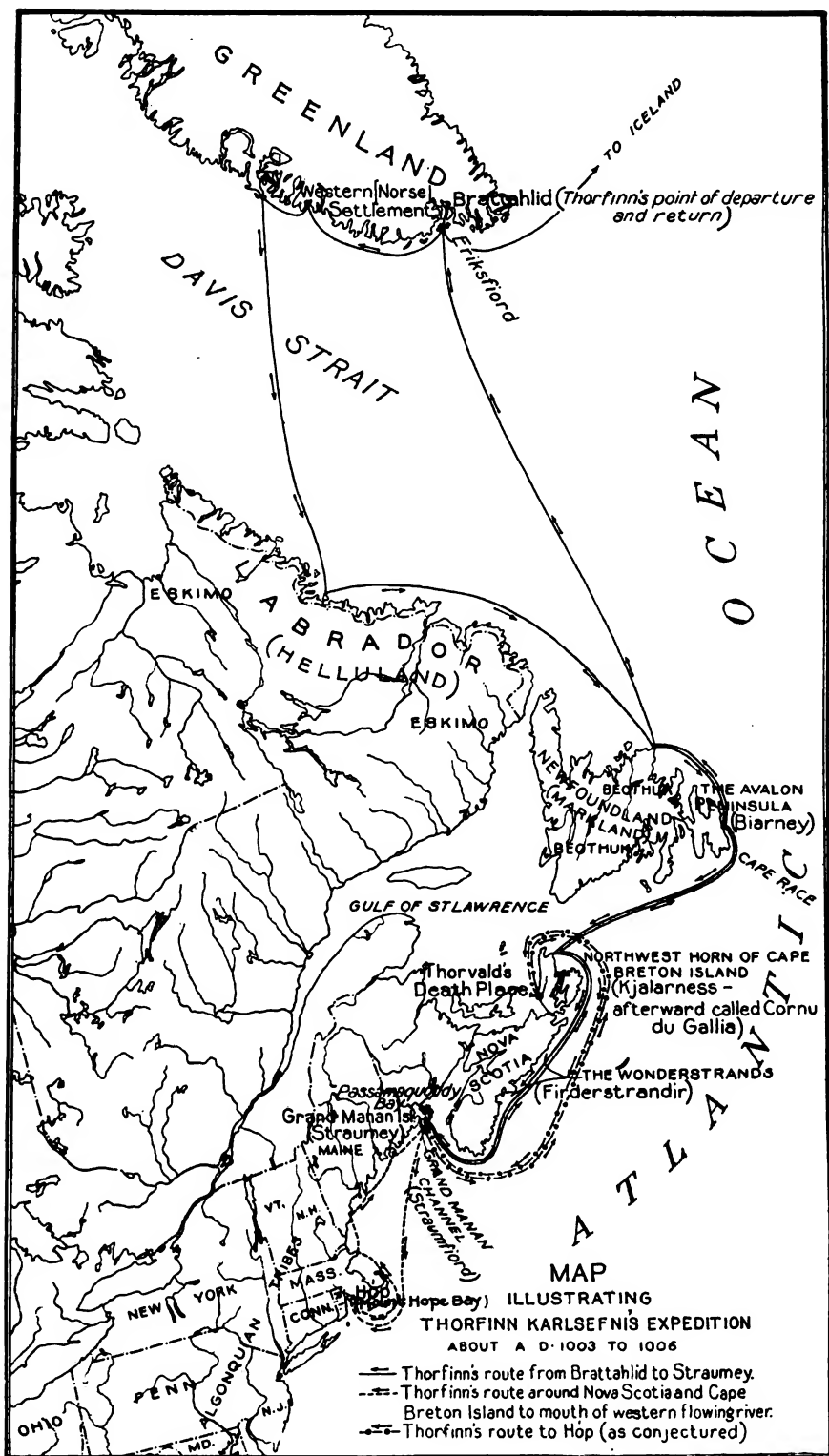
We may find something artificial in the periodicity of the "two doegr" interval, once repeated in the Saga of Thorfinn Karlsefni, twice in the more precise companion Saga of Eric the Red; and undoubtedly such conventional divisions are a stock property of old sea-exploring tales. Thus there are three periods in the outward voyage of Edrisi's¹ Magrurin, first about eleven days, then twelve, and then twelve again. But in tracing a coast for suitable settlement sites, a periodical inspection might be planned from the outset for the earlier part of the work by way of saving time, and to keep the record brief, as it should be if in runic characters. This plan would answer very well until they should reach habitable country, which would require to be examined more minutely; and, in point of fact, we hear no more of the "doegr" after the landing at Keelness. It will not do to say that every statement of regularly divided human undertaking is untrue because regular divisions occur also in stories mainly fanciful. Thorfinn comes before us as a wary, systematic, and successful personage, and the method here indicated seems quite in character. The parallel with myths and folk-tales has little value, except where the events narrated and divided are clearly fortuitous.

Newfoundland cannot be Helluland (as some used to think) for several reasons; in particular, it is not severe, bare, and stony enough, and has far too few Arctic foxes. Prof. Packard,² who had scientifically studied these regions, declares for the eastern face of Labrador, perhaps "near Cape Harrison or along the coast to the northward." Sir Clements Markham,³ another and very competent

¹ Edrisi: *Géographie*. Jaubert's transl., vol. 2, p. 27.

² The Labrador Coast, p. 11.

³ Remarks on Dr. Nansen's paper. *London Geogr. Journ.*, Dec. 1911.



eye-witness ;¹ Dr. Grenfell, who has spent most of his life in humane service along that shore ; Mr. W. S. Wallace, his historical coadjutor and Dr. Storm,² reasoning from totally different experience and data, all take the same view, but with less local exactness. It is needless to add further corroboration. Helluland was Labrador, although it may have been first seen in the stretch between Hopedale and Nain.

From the islands near Godthaab to a point slightly below Nain may be 450 miles. The assumed impossibility of Thorfinn's making the crossing in the time stated (probably 48 hours for open sea-sailing like this) led Mr. Reeves to suggest a copyist's error, substituting "two" for seven. But this is purely hypothetical, involves a really prodigious time-allowance and would call for too much later repetition of verbal errors, as well as too great length for the entire journey.

It may be well to see what has been actually recorded in more recent times. A writer on long distance lake-racing in "Yachting," for June, 1910, page 407, cites the "Vencidor" as making 331 miles in 34 hours, with wind astern or nearly so, a third of the distance being "through rockstrewn channels, where reefs and islands furnish continually shifting currents and high shores give baffling slants of wind." This is nearly at the rate of ten miles an hour, and perhaps we may fairly suppose twelve or more for the two-thirds of open water. Again, on the Atlantic between Nassau and Havana, we learn ;³ "The 'America' logged a distance of 400 miles in 40 hours, 260 of which was made in the first twenty-four hours." This seems a reasonably fair comparison, the voyage being in about the same direction as Thorfinn's and for only a little less distance, though in much more southern latitudes. No doubt the difference between the distance made in the first day and that in the second is to be explained by some change either in the course or the wind. We are given to understand that there was neither in the Norsemen's case.

Now this schooner-yacht "America" was beaten by "the big sloop 'Maria,' " which "walked away from her" "in sea-sailing before the wind, and we are assured by the same work that this feat would probably have been repeated as often as undertaken and at any time. Further, we find that the proportions of the "Maria," 110 feet by 26 feet 8 inches, and 6 feet greatest draft, were substantially those

¹ Labrador, the Country and the People, by W. T. Grenfell and others, containing Wallace's historical monograph.

² Studies on the Vineland Voyages, already cited.

³ G. Bleckman and P. Newton, The Blue Ribbon of the Sea, p. 60.

⁴ *Ibid.*, p. 34.

of the old Norse pattern; why then could not Thorfinn's big sloops, with everything in their favor, duplicate the "America's" feat, or at least make 450 miles in 48 hours? That is less than ten miles an hour, a speed which has been exceeded for a long stretch by ordinary coasting craft on the Chesapeake. Twelve miles an hour would give 140 miles more than we need.

We are told that this northern wind held, and that they sailed another 48 hours to Markland, at first eastward then southward. Dr. Nansen thinks this direction unwise and unlikely, but the coastline trends that way; they had to get around the southeast corner of Labrador, and hugging the shore might be dangerous. Exactness is impossible, but it would seem that the interval stated might well bring them to the forested front of Newfoundland near Bonavista Bay, allowing for loss of speed in change of course. The experiment might be made by some of our enterprising yachtsmen and would be watched with interest.

Newfoundland has some claims to be called Markland still, according to Bishop Howley's¹ description, even most of its northern part being fairly well wooded. We have no reason to infer any other aspect then, excepting that the forest would be more general and more heavy. Whitbourne² early in the seventeenth century averred that "No country can show pine and birch trees of such height and greatness," and Blome,³ about the same time, testified to the "abundance of stately trees fit for timber." The vegetation of Markland has perhaps hardly changed at all, and the abundance of wild game mentioned by the saga has always characterized the island.

Thorfinn could not be expected to know it as such, having quite skipped the Strait of Belle Isle in the loop around the bending coast from upper or middle Labrador to middle or lower Newfoundland; but if they had followed this closely, it might have made little difference, for both Cortereal and Davis (according to Wallace) took that passage for a mere cul-de-sac, like Hamilton's Inlet farther north.

The island called Biarney to the southeast of Markland may be the large Avalon peninsula, even now almost cut off by water. If it were not quite wholly cut off then, it might well appear so, being incompletely investigated. We must not charge any early voyagers with modern knowledge of geography. Besides instances above

¹ Vinland Vindicated, already cited.

² A Discovery of Newfoundland, p. 10.

³ R. Blome: Isles and Territories, p. 1 (325).

given, Cabot¹ probably misunderstood Avalon as did Thorfinn, calling it the isle of St. John; and Cartier,² after sailing into the Gulf, could only say that Newfoundland was *probably* an island. Some of the early maps also show Avalon as insular.

The Skrellings (or savages) encountered on their return may have been Beothuk. Dr. Rink³ thought the man's name was probably Eskimo, a corruption of the word for "her husband," but Thalbitzer⁴ holds otherwise (see p. 105 ante and note 9, p. 177). The underground dwellings⁵ remind one of the Eskimo legends concerning "inlanders," presumably northern Indians, Nascopie or Tinné. The "beard" of the escaping man was possibly a mask or some misunderstood garment, though the practice of plucking out hairs proves that a beard might grow on Amerinds, and other early bearded individuals are reported along our coast. It is true that the Labrador Eskimo were contending for foothold on the upper Newfoundland coast early in the sixteenth century, and may have been thus engaged in the eleventh, but their presence in wooded regions seems unlikely. We can make little of these Marklanders, perhaps because the Icelanders tell us so little that is trustworthy about them, and the English and French so little, trustworthy or not, about the Beothuk.⁶ When we first really see the latter, they are an interior tribe hiding from the encompassing peoples, "altogether in the north and west part" says Whitbourne. Cartwright⁷ (1770) says that summers often passed without one being seen; and they kept this over-prudent habit till the end, which was probably a good deal later than the last known death (of a captive in 1829). One corpse was found aboveground in 1886; but it can hardly have lasted fifty years. Cormack,⁸ who reached their home on Red Indian Lake in 1828, thought the remnant of them hidden, not dead. Their arts, stature, and prowess may indicate some infusion of Norse blood.

In this identification of Newfoundland with Markland, Packard, Nansen, and Storm and other authorities all agree; and there are

¹ M. F. Howley: *The Ecclesiastical History of Newfoundland*.

² Cartier's *Voyages*: Orig. Narr. Amer. Hist.; also J. Winsor: *From Cartier to Frontenac*.

³ H. J. Rink: *Tales and Traditions of the Eskimo*, p. 74.

⁴ W. Thalbitzer: *The Eskimo Language*, p. 20.

⁵ H. J. Rink: *Tales and Traditions of the Eskimo*, pp. 262, 298.

⁶ Alan MacDougall: *The Beothuk Indians*. Trans. Royal Inst. of Canada, 1890-1891, p. 8.

⁷ Capt. Cartwright's *Journal*, republished 1911, first 20 pages.

⁸ Cormack: *Journey in Search of the Red Indians in Newfoundland*. Edinb. Philos. Journ., vol. 6, 1828-1829, p. 327.

no opposing names that should carry equal weight. Also, the facts uphold them.

The words of the saga from their third start are: "When two doegr had elapsed they descried land." Then they must have been without sight of it, at least ahead. Presumably, having rounded Biarney, they kept along, nearly parallel to the lower face of Newfoundland, in "the sea flowing in between Wineland and Markland," which we know as the Strait of Cabot. They may even have gone farther, before turning to the opposite northern promontory of Wineland (now Cape Breton Island west of the Bras d'Or inland sea), for we know that Thorhall, an experienced explorer, afterward loudly complained that they had neglected this better course to Wineland, and insisted on going back to try it; and this theory of his, with other expressions like sailing "around Keelness," imply some notion of the great Gulf beyond the long promontory's tip. The Saga of Thorfinn Karlsefni does not specify the time consumed before making the new landfall and is not so clear in its indication of crossing the intervening water. Furthermore, it mentions sailing south along the land; but we must not be too literal about directions. We find Champlain saying south, when he clearly means southeast, and repeatedly parting company with the map in such details, though he had a compass to guide him and was unusually careful. With Thorfinn it was guess-work and sun-piloting or star-piloting; and they have many fogs in those regions. The two parallel versions agree substantially, here as elsewhere, and help out each other's details; but that of Eric the Red is, I think, a little the clearer.

Whether they used up 48 hours or not in the passage, they had to "beat back" a rather long way into the wind, or we should hardly have heard of the disadvantage; so they must have been well on toward the tip of Keelness before turning to tack eastward through the strait, with, of course, the land on their right. This shore was that on which they are said to have found the keel of a ship, washed down presumably by the Labrador current, perhaps a relic of Eric's broken fleet. Those investigators who have tried to pick out a particular point as Keelness are clearly wrong; for Stefánsson's equivalent "promontorium Winelandium" is a great though upwardly tapering body of land, and the suffix "ness" is to be understood, as in Snaefellsness and generally in Iceland, to include the whole jutting area of western Cape Breton Island. We have indeed a similar use of "Neck" along Chesapeake Bay, for it means in common parlance not the connecting isthmus nor any spot or tooth of land, but always the

entire mass which is nearly insulated. In this sense it is also an accepted geographic term, to be found plentifully on Maryland maps.¹ Some of these "necks" are of considerable area.

That this Keelness is in fact an island goes for nothing. Many after their time were slow in finding it out, as in the more remarkable case of the Strait of Belle Isle. Wytfliet's map of 1597 shows Cape Breton Island as a solid horn, integral with the mainland of Nova Scotia, and so, on a smaller scale, does the map attributed to Sebastian Cabot; though they multiply outlying islands. Mercator, 1587, goes to the other extreme, however, by setting it well out from shore with the significant inscription "*Drogio dit Cornu du Gallia.*" Thus some geographers knew Cape Breton's insularity and some did not, after a century's opportunity to ascertain.

A different explanation of the name Keelness is offered by the Flateybook Saga, namely, that it has the form of a ship's keel; and this records an observed resemblance as old as the fourteenth century. A great part of the island is hollow now. When the lowlying southeastern side was under water, the resemblance of the remaining horn on the western side to a keel would be more obvious. But since there was a Kjalarness in Iceland, probably well known to some of these explorers, we may safely assume a simple transfer of the name. The saga laid stress on this northern horn of Wineland, for no navigator who might follow could miss finding a feature so conspicuous.

The course of the ships is explained by it at every turn, as though it were a main pivot of proceedings in that quarter. It is on the starboard in the saga as the ships go south along the coast; on the larboard as Thorfinn long afterward reverses the course to pass round it into the Gulf after the missing Thorhall; he anchors on its western side in a westward flowing river (the Margarie or the Mabou) and passes northward along it in leaving that region. Each point is made with precision almost as if dictating items for a map. The original narrator evidently intended that there should be no misunderstanding of this great peninsula; but every one is at the mercy of mankind and the centuries.

There is a further argument for Cape Breton Island as Keelness in the corresponding position of the tip of the former and that of Stefánsson's Promontorium Winelandium as compared with the latitude of Britain and Ireland. Also, the Stefánsson map has a range of elevations running up into it, quite inconsistent with Cape Cod,

¹For example Lake, Griffing and Stevenson. *Atlas of Kent and Queen Anne Counties, Maryland*, p. 30 and elsewhere.

the only competitor that has been seriously urged. Finally, the stranding of the wreck which left its keel, if we may treat this as a verity, would be much more likely to occur on Cape Breton Island than on Cape Cod in times when the sailing was all farther northward, and in view of the arrangement and direction of the ocean streams. But we are at liberty to dismiss the keel.

A wonderful succession of beaches and low shores began with Keelness, being whatever was above water of the eastern earth-wall of the Bras d'Or and the main seashore of Nova Scotia. Apparently it was such a coast as we find now along New Jersey or Maryland, seemingly interminable strands, with nothing but low sand dunes and occasional inlets to break the monotony of desolation and loneliness. Few things in nature are more impressive, but it is not a cheering impression. We may fancy Gudrid and her companions looking over the landward gunwale at that unchanging panorama, with woods and hills of little variety for a background, and wondering if they would never have done. Surely we can give no other meaning to "This was a bleak coast with low and sandy shores. They called them wonderstrands because they were so long." The plural may indicate slight breaks in the outline here and there.

These people had swift ships. Beaches of ordinary length must also have been familiar to all of them. They would not feel a monotonous sail of but four or five hours. They would not marvel at a stretch of fifty miles; but if they had to follow down from Cape Henlopen to Cape Charles, or along any equal stretch of strand, they might well record the wearying novelty as a "wonder." It would rank equal with the great treeless wastes of Helluland or the immense forest area below, or that great "ness" which guarded the entrance to the inner Gulf. I think the Wonderstrands must have stretched for at least a hundred miles.

On grounds to be explained, it seems more than probable that the main Wineland home of these settlers was at the mouth of the Bay of Fundy. Between the tip of Cape Breton and that point, we have the outer coast-line of Nova Scotia, said to be somewhat over three hundred and fifty miles. Obviously then, the outer coast-line of Nova Scotia was their Wonderstrands. The palpable fact that Nova Scotia does not now supply these wonderstrands except perhaps on a lesser, though relatively considerable scale along the front of Richmond County over which boats are sometimes drawn, to the interior Bras d'Or, seems to have compelled Dr. Storm to piece out this part of his theory with minor beaches that the Icelanders would

have hardly glanced at as they swept by. What would a mile of sand be to such craft and such spirits as theirs? Even a man in a row-boat would not have time to weary of that. Make it ten miles, and the case is yet even absurdly hopeless; for ten consecutive miles of strand cannot be found along the mainland of Nova Scotia. Thirty miles or so of low shore may be found perhaps in eastern Cape Breton Island, but would be little better if above water then. The plain fact is that the saga must be given up as false, in this part at least, and—since this is of its very spinal cord—as untrustworthy altogether or we must assume the erroneous transfer to this point of an observation made elsewhere, unless there be some adequate explanation. And there is such explanation. The coast line now consists generally of low cliffs or banks, not comparable to the lofty precipices of Grand Manan, but let us suppose that this is not constant in height, but that, for good reason, it has been rising continually. Reckoning back, it would be correspondingly lower at any given time, supposing no counteracting cause intervened to reverse or check it or vary the rate of emergence.

Our starting point is about a present average of 25 feet, perhaps rather more—as indeed my own slight and local observations would make me suppose. But the above has been given me as a rough approximation by a journalist formerly resident in that province, and is pretty well confirmed by a Boston yachtsman and an intelligent fisherman of Grand Manan, both personally familiar with that shore. Of course it is barely provisional, exactness not being hoped for.

It does not seem to have occurred to anyone concerned in such researches that a definite and steady change may have been going on. Rev. Mr. Slafter offers the nearest approach, that I recall, to such a view, in the suggestion that islands have shifted and new land has formed, making identification impracticable—but that is obviously far from presenting a consciousness of explainable, progressive change. Now conceive the Nova Scotian seaboard lowered by the 25 feet or more of its present height, that is, brought down to water-level and dipped a little under—with slight narrowing of the peninsula, in its mainland part, and partial obliteration of the eastern side of the now hollow insular terminal part called Cape Breton Island—and you will have something not wholly unlike the long strands of New Jersey or the peninsula east of the Chesapeake, only with the hill country much nearer. It was the first introduction of the surprised northern visitors to the characteristic American coast line.

The probable reason for such a change is simple enough. The withdrawal northward of the great glacial ice-cap, from half a mile

to two miles in thickness, freed all the continent as far down as the southern border of New England from an enormous weight and chill. Forthwith the elasticity of the strata began lifting them slowly behind it, and the movement continues still in a great slow wave, even after the lapse of some thousands of years.

Prof. Packard¹ long ago quoted a previous observer as to the uplifting of the Labrador coast, adding his own testimony. Prof. McGee, whom I have consulted, puts the neutral point where there is neither ascent nor descent, on the Gulf of Maine, north of Boston, perhaps not far from the New Hampshire line, but the recent investigations of Mr. Davis² carry it somewhat farther north. All above rises; below it is the resulting depression or trough of the earth wave, gradually lessening in downward movement. Apparently the earth crust behaves like a blanket undulated. Professor Brown of Brown's University writes that five hundred feet of uplift in all are reported from Labrador, and nearly seven hundred from parts of the Hudson Bay region. Prof. Shaler³ has elaborately explained this depression and re-elevation. Mr. Davis's marsh investigations add another proof of the movement by demonstrating the complementary recent sinking below. The recent work on Labrador, the Country and the People, by W. T. Grenfell and others contains on page 118 a map giving the figures of uplift since the glacial era at various points of the Newfoundland and Labrador front, making 575 feet at St. Johns the maximum. Pages 127-135, etc., of this section, by R. A. Daly, add further discussion of this phenomenon and the general testimony of residents of the coast to its continuance.

Even these results would have seemed inadequate while men held by the prodigious periods of the astronomical glacial theories. But the observations of Shaler at Niagara, and of other investigators, all the way from the northwest to the Atlantic ocean, have built up a

¹ A. S. Packard: *The Labrador Coast*.

² C. A. Davis: *Salt Marsh Formation*. *Economic Geology*, vol. 5, no. 7 (1910).

³ N. S. Shaler: *Nature and Man in America*, p. 96 and context; also his *Aspects of the Earth*, pp. 2, 3, 6, 7, "As when a glacial sheet is imposed on a continent—as it was in the immediate past in North America—a wide area of the ice-laden land sank beneath the sea; to recover its level when the depressing burden was removed." Cf. A. R. Wallace: *The Geographical Distribution of Animals*, vol. 1, p. 152—"the weight of ice piled up in the north would cause the land surface to sink there, perhaps unequally, owing to the varying nature of the interior crust of the earth; and since the weight has been removed land would rise again still somewhat irregularly, and thus the phenomena of raised beaches of arctic shells in temperate latitudes are explained."

great array of evidence, tending to reduce the interval from hundreds of thousands to a very few thousand years.

Wright's Greenland Ice Fields and The Ice Age in North America long ago presented this matter strongly, though without converting every one. More recently in the *Anthropologist* he has suggested 5000 B. C., and perhaps the prevailing estimate of the interval since the beginning of the withdrawal of the only ice-sheet which can have directly affected the fortunes of man would now make it less than eight times the nine hundred years since the coming of Thorfinn, though there are some dissentients.

Of course the lifting forces or the resistance may have varied in stress from time to time, for reasons not readily to be fathomed, or some other crustal movements may have interposed, or there may have been counteracting influences yet unknown. Also there may have been local eddy-like exceptions of downward crumpling or earthquake depression,¹ as perhaps on the shore of the Bay of Acadia, not affecting the Atlantic coast. This depression seems to have ended long ago, and may perhaps be paired with the convulsion that sank so much land, leaving tree stumps at the bottom of lakes and in marshes near New Madrid, Missouri, early in the nineteenth century.

Perhaps there has not been sufficient search for direct evidence *in situ* of uplift along the Nova Scotian coast such as we have so strikingly from Labrador and the upper part of the Maine seashore. Locally there is some scientific opinion or feeling that this probably has not occurred. Indeed a positive descent² of the shore at certain points, notably Louisbourg, used to be inferred from the submergence of the old French works. But later investigation³ has shown that the facts do not call for such an inference, the military architects having planted their embankments in the water; and no change either way in elevation can be said to be directly proved. There has not been time for any conspicuous effect, and the shifting of water currents and of sand, or other local conditions may apparently reduce it.

Nova Scotian direct evidence not counting either way, we must accept for guide the action of natural laws shown to have taken effect on the relatively more southern, as well as the more northern,

¹ J. W. Dawson: *Acadian Geology*, p. 3; also supplement, pp. 13-21.

² Gessner: in *Journ. Geol. Soc. London*, vol. 18, p. 36.

³ H. S. Poole: *Subsidence of the Atlantic Coast Line of Nova Scotia*. *Trans. Nova Scotian Inst. of Science*, vol. 11, p. 262 and McIntosh, p. 264.

parts of the American Atlantic coast. In the absence of any indication of counteracting forces, it would be unreasonable to arbitrarily assume them. What has happened and is happening between Norfolk and Boston implies a corresponding reverse movement in the coast between Labrador and the middle of Maine, or wherever the neutral point may be. This reach of shore almost certainly includes Nova Scotia; the sea-front of which has the air of an emerging shore, as different as possible from a descending one, where old river valleys become broadened estuaries, bordered by marshes, low islands and broad sand banks, as in the region of the Chesapeake and Delaware.

Dr. Nansen, discarding the explanation of the saga and apparently forgetting the natural transformation of a coast-line in a formerly glaciated region, supposes that the Wonderstrands were originally named for the wonders which they exhibited. He does not suggest what these may have been beyond a hesitating note concerning wonderfully beautiful islands of myth and fancy. But there is surely only a faint verbal link between the wonder of supreme beauty and the wonder of impressive desolation. Also it is most incredible that the saga should have omitted all mention of prodigies which conferred one of its most important local names. And what marvels could they own, surpassing the almost appalling interminable succession of strands and dunes, constituting now as then the dominant typical American coast-line?

Whatever else may be doubted there is no denying that some Ice-lander, before 1334—when Hauk died, who copied for us the passage in question, had become acquainted with the American Atlantic coast as we see it now with slight breaks in its upper part from the tip of Florida to the tip of Cape Cod. Did Hauk come here or the sagaman? There is no record of any visits before that time except those of the saga and even the Flateybook version avers that “of all men Karlsefni has given the most exact accounts of all these voyages.” Leif must already have seen that strange coast and prepared him for it. There is no great reason to doubt that Thorfinn saw it also.

The Wonderstrands (if Nova Scotia) were not remarkable for high tides and strong currents. On the contrary, these were (and are) rather feeble. Cabot found but $2\frac{3}{4}$ to 4 feet of rise and fall, and HARRISSE,¹ reporting him, says: “This diminutiveness is peculiar to

¹ H. HARRISSE: *The Discovery of North America*, p. 8.

the entire coast, from Nova Scotia to Labrador.”¹ An intelligent white native of Grand Manan, being asked in my presence about its great tides, at once mentioned the two feet or three feet tides of the Magdalen Islands, which he had visited—a contrast as sharp as that between the sea-level upper coast in 1003, and his own miles of towering cliffs. The latter would lose little in impressiveness by 30 feet or even 60 feet of lowering; and the great rush of water up Straumfiord (Grand Manan Channel) along their northwestern front, would perhaps be a little greater than it is now, but certainly not less.

The same applies to the series of more than picturesque, deep, broad, fiord-like indentions, mountain-sentineled, with lofty islands out before them or in them, and contours for the most part necessarily unchanging in a thousand years, which characterize the upper sea-coast of Maine, beginning with Passamaquoddy Bay. For Grand Manan, lying across the front of the admirable inner expanse, visible, as Denys says, from afar at sea, and necessarily the next land for the explorers as they crossed the Bay of Fundy (heading a little west of north after rounding the nose of Nova Scotia, and avoiding the shoals of the Admiralty chart) was indeed the herald of a new order of things. It is no wonder that even these Icelanders, accustomed to mountains and sea-currents, were deeply impressed by the change.

Osgood's book on the Maritime Provinces wakens to something of an outburst about "Grand Manan," which "lies in the mouth of the Bay of Fundy, whose giant tides sweep imperiously by its shores." This, however, would not now apply quite perfectly to the sloping, harbor-indented, inhabited southeastern side, with its outlying fringe of low islands, though the official chart shows violent tide rips, and Dr. Fewkes testifies to "currents of great power." It is the "back of the island," as they call it, the wilderness side (whence you may look down on Campobello near Eastport and plainly distinguish many of the western mainland mountains), which enjoys the roughest kisses of the racing tide. No one who watches the gulls sway backward and forward in great fleets in the rush of water and the long eddy off the north point by the fog whistle, or keeps company a bit with the dulse-gatherers on the slippery rocks, or looks down from the southern cliffs on the foam about their bases, or considers the wave-carven

¹The following figures are given by Verplanck Colvin in his *Calculations on "Plutarch's Account of Ancient Voyages to the New World,"* p. 3: Hopedale, Labrador 7 feet; Anticosti, 5 feet; St. Johns, N. F., 6 feet; Trinity Bay, N. F., 3½ feet; Kennebec, 9 feet; Portland, 9.9 feet; Boston, 11 feet; New London, 3 feet; New York, 5 feet.

"Hole-in-the-wall," the seated "Bishop," now losing his outline, and the progressively defaced but still recognizable "Southern Cross"—no one who has ever crossed in slightly roughened weather the disturbing inflow of the western strait, or stood on Todd's Point in Eastport, the most easterly bit of land of the United States, and tossed pebbles into the hurry of the twenty-five feet of tide that chafes the rocky little promontory—will be likely to question Osgood's description, or the propriety of the names Norsemen-given. Thus Dr. Fewkes¹ reports "sometimes the moving water is irresistible, carrying everything along with it under the brow of the high land."

It is not well to be blindly confident in such matters, and any further light on the subject will be most welcome; but with the information at hand, after much endeavor, this identification seems to me most likely. The Flateybook's account is badly blurred in the telling, and too confusingly blends the characteristics of Hóp and Straumfiord (without mentioning the former) to be very helpful; but even in it we have the outlying island, which must have especially impressed all the party; and the description of the wide shallows left by the ebbing tide belongs peculiarly to the lateral branches and upper arms of the Bay of Fundy. It could not well be otherwise, with sixty-feet daily change of level at Monkton, and thirty-two feet even at the reversing falls of St. John. The Bay of Fundy is simply unique in these respects on our coast and Straumey and Straumfiord can belong nowhere else (see note 10, p. 178).

Nearly all the statements of the trustworthy and little defaced narrative of the two parallel sagas are exactly borne out by present facts. They came to "a fiord-cut shore" of mountain valleys filled with water, forming bays, and these in due succession are there still. They sailed into one of these bays or fiords, a statement twice made, curiously marking as already stated where a later hand has interpolated the apocryphal episode of the Gaelic runners Haki and Hækia. "They sailed through the firth" to reach this bay, which was included under the same name, for we read later that "in the spring they went into Straumfiord and obtained provisions from both regions." Of course the same passage has to be made still, and of course the strait and bay are connected; though their union was no doubt more obvious then, a good part of the narrow Campobello island and Lubec headland being under water. These, with Eastport island and other neighboring territory would appear as minor islets in a somewhat larger

¹J. W. Fewkes: A Zoölogical Reconnoissance in Grand Manan. American Naturalist, May, 1890, p. 424.

bay than now remains, then opening rather freely to the strait. With regard to the precise farther extension of Straumfiord, as they understood it, we need not concern ourselves; and probably they did not define this, any more than the average man of lower Manhattan who mentions and sees "the North River" has any clear idea whether its utmost north is in the Adirondacks, Vermont, or Canada. They cared mainly, though not quite wholly, for what directly affected their welfare. The eggs of the island, ducks' eggs according to the saga of Eric, birds' eggs according to that of Thorfinn Karlsefni, which is a little the better in this instance, are a case in point. They were probably gulls' eggs, cormorants' eggs, and those of the eider-duck, black duck, and other water fowl. The numerous gulls still lay some eggs in the most nearly inaccessible niches of the cliffs near South Head. Above it there is a fine level table land, which may well have been fully occupied by nesting sea-fowl in the times before the advent of men (and boys), aided in destruction, as I am told, by a great recent multiplication of hungry foxes. It is not surprising that most of the egg-laying is now done on the outlying islets, where persecution is less constant.

Denys,¹ about 1645, after defining Passamaquoddy Bay as "a cove of great circuit," says "Opposite the last cove and some distance out at sea, occur some islands, the largest of which is called the island of Menane. It can be seen from afar as one comes from the sea On all these islands . . . there is a great number of all kinds of birds which go there in the spring to produce their young."

It was the proper locality for such finds. Champlain tells us of filling a cask with cormorant eggs on Hope Island, and of an almost unbelievable number of birds, including ducks of three different kinds, on the Tusket Islands, all about the mouth of Fundy Bay. Also a little later, when the eggs had become young birds, he collected many of the latter on the Wolves, only a short distance up Fundy Bay from Grand Manan. It is not certain that he landed on the latter, though he sailed near it three times at least and anchored once in Seal Cove, a harbor of its more accessible side, with almost a shipwreck.

Dr. Nansen doubts the plentiful nesting of birds, thinks them a Norwegian reminiscence, and in particular excludes gulls and auks. But a local ornithologist of North Head, Grand Manan, who is as well informed on the subject as anybody in the world, gives me by letter

¹ N. Denys: Description of the Coast of North America. Ganong's transl., pp. 110, 111.

the places and nesting times for razor-billed auks, American eider ducks and herring gulls, all quite near him, 500 to 1,000 eggs of the last-named being still collected annually from one islet before the brief open season ends. After that they are rigidly preserved. See also Packard's account already cited of the multitudinous nesting gannets and lesser birds on rocky islands in the Gulf of St. Lawrence, and Cartwright's and Cartier's as to like conditions on Funk Island off the Newfoundland Atlantic shore.

It is a curious but easily explainable fact that our white people have largely followed Indian paths and settled in numbers on Indian village sites. The same conveniences, obstacles and allurements affect both alike, to a certain point, in the simpler matters of existence. There may be a special illustration of this in the established and ancient habit of the Passamaquoddy Indians, to cross and recross the strait annually in their canoes, having their home astride of it, so to speak, and obtaining supplies from both shores. They no longer maintain a permanent village on the island, having withdrawn for superstitious reasons (it is said) but the habit of annual or more frequent migrations across Grand Manan Channel for sport and food is hardly yet abandoned. The Norsemen did likewise and for like reasons, the resources being enumerated in the saga. It is perhaps a case where the usual procedure had been reversed, the Indian following the white man, for that region seems to have been empty of inhabitants on their arrival and during the three years (once interrupted) of their occupancy, as Strachey declares the lower course of the Susquehanna to have been, or as some parts of Kentucky perhaps were, or lower Greenland at the time of Eric's settlement; indeed, until after 1300, according to Dr. Rink¹ and Dr. Storm. It is a common phenomenon in the case of a sparse native population, not deeply anchored.

The Indians of the region at the time of our first knowledge concerning them were the Micmac or Souriquois of Nova Scotia, extending west of the head of the Bay of Fundy into Northern New Brunswick, the Malicete or Milicete of the western side of the bay and the Passamaquoddy, often referred to on Grand Manan as the American Indians. The Maguaguadevic Indians about St. George and the neighboring lakes are the border tribe of Malicete on the Passamaquoddy side. There is said to be a portrait of one in the Illustrated London News of Sept. 5, 1863. They were notable for at least one dolmen-

¹ H. A. Rink: *Tales and Traditions of the Eskimo*, p. 74.

like stone erection¹ with an oval roof-tablet, supposed to have been set up by them but now long overturned, and perhaps for the stone medallion already mentioned, which was found in their territory.

Right there was the meeting point of two streams of Indian migration, as it had been previously the border of Norse occupancy, or at least the scene of daily Norse excursions after game. The Micmac, and presumably the rather more nearly related Malicete, followed down the St. Lawrence valley, while the Penobscot and their kindred the Passamaquoddy appear to have worked on up the Atlantic. All these people were of the ancient Algonquian stem, but the two branches had been long separated when fate thus drew them again together; for even yet the languages² of the Malicete and Passamaquoddy borderers differ considerably and the Micmac use a very different pattern of canoe (upturned at both ends) from that of the "American Indians," although occasionally visiting, from near Digby, the same island of Grand Manan.

We do not know when this first meeting took place; but, as before emphasized, the Norse date (say 1003) is very early. If we suppose that the movement down the St. Lawrence valley had not yet reached the site of Monckton nor the upper waters of the St. John and that the movement up the Atlantic coast had not yet passed the Kennebec, we shall have the requisite Indian vacuum. There is nothing to suggest that any Eskimo ever crossed the Maritime Provinces in those days or skirted their eastern border, no reason to suppose that the Beothuk extended so far down the coast, and we cannot assume any other native occupants for this corner of the Bay of Fundy shore.

Any one who will mount Battery Hill above Eastport and look about him will understand "there were mountains around"; the country is "fine" still and the hay crop both on the mainland and Grand Manan—for we were there in the height of that season—is really remarkable. They must have found excellent grazing. Excellent hunting, too, for the resources are not yet exhausted. We were told of a moose which had recently visited the bay shore near Eastport and were offered in that city the skins of seals shot by Indians very recently on or near Grand Manan. A whale had entered within a few days the cove of that name, beside which we were lodged on the island, just as another came into the hands of Thorfinn's people, to their temporary discomfiture. They would be likely to establish them-

¹ Jack: Stone Found in New Brunswick. Smithsonian Rep. for 1881, before cited.

² Trans. Royal Soc. Canada, 1904, p. 20.

selves there or near the northern point where the Indians afterward had their annually occupied settlement, and close at hand are the cliffs, on one of which they caught Thorhall worshipping Thor, and over which they may have cast the fragments of whale-flesh "on the rocks."

It was most natural that Norsemen should be deceived by the bountiful mild season into the belief that they need not provide against winter, since they felt themselves in Leif's country, which was said to be like Africa. De Monts' colonists on an island of the St. Croix, flowing into the same bay, though far better provided in every respect, had a most discouraging and even ghastly winter. Their best man, Champlain,¹ appositely declares:

It would be very difficult to ascertain the character of this region without spending a winter in it; for on arriving here in summer everything is very agreeable, in consequence of the woods, fine country and the many varieties of good fish which are found there. There are six months of winter in this country.

The summer advantages could never have been greater than when the Norsemen came. When winter struck them and the game had withdrawn to a distance and the snow impeded their landward travel, it was not unnatural that they should shift to the great island, where fish and amphibious animals were closer at hand, also from which the land animals could not well escape. Moose were found on it in the boyhood of an elderly resident, who talked with me, and there are still some deer, though partly at least of late reintroduction. It ought to have been easy to arrange a drive of animals toward some corner of the cliffs and supply themselves with meat; and when it was not possible to fish outside there were (and are) trout in the brooks, also eels, on which the Indians afterward depended, in a string of ponds, the most northerly and best known of which is in the wilderness between the old Indian site (now a hamlet of fishers and dulse gatherers) and the prosperous village of North Head. There could be no lack of good fresh water.

The migration to the island seems a wise move, and perhaps did more than anything else to carry them through without the deaths and disabling maladies of Champlain's companions. Their stock also lived, and thrived, probably on birch-twigs, dried fish (for Norwegian cattle are said to make the best of such winter fare) and the half dry grasses and other vegetable survivals of the springy inland hollows and southeastern marshes. The sea never freezes there and the tide would always wash up or lay bare something that might be of service.

¹ Voyages of Champlain. Original Narratives of Early American History.

But at the best it would be a disappointing winter, without any store of grain such as they might have had in a country where wild rice was plentiful and without the wine which Thorhall angrily celebrates between lamentation and satire. It is impossible not to sympathize with his disillusion in the matter of this Wineland. We can readily understand his disbelief that this could be the real region or even the right course for reaching it. Thorfinn was right, and matters would not have been mended by turning into the Gulf of St. Lawrence, as he afterwards found; but it was all experimental at first, opinion against opinion, the chief trouble being that Leif had given them a standard which was true for a more southern part of the coast, but very misleading and disappointing when they applied it to northeastern Maine and the neighboring corner of New Brunswick.

These occurrences bring out saliently the fact that they found no "unsown wheat" nor grapevines at Straumfiord or on Straumey. They do not profess to have done so. There is not the least entry indicating either plant, or its grain or fruit, except the interpolated story of Haki and Hækia who ran "to the south," we do not know how far (but they were "fleeter than deer"), and brought back single specimens only. If there be any truth in this episode, and if it belongs to the narrative not of Leif but of Thorfinn, we must place it with the explorations of that first summer or early autumn. Their bunch might probably have been obtained from the Penobscot in the three half days allowed them. Champlain found a few large grapes and grapevines on the lower Maine coast, but none anywhere above Portland nor inland in Nova Scotia. According to Lescarbot,¹ the apothecary of their expedition desired to transplant Cape Cod grape vines to the lovely Annapolis valley of the latter province, which had none, though one would expect them to spring up there spontaneously, if anywhere in all that province.

The general result of inquiries among Maine people is that wild grapes of proper size and quality for table use or wine-making do not ripen in that State, owing to the shortness of the summer and the severity of the frosts, so as to benefit anybody appreciably except the botanists. But if some far ranging runners brought even two or three back to Thorfinn from the southward these might confirm his resolution to seek in that direction a country where such things abounded. When he had compromised with Thorhall and seen him "prepare for his voyage below the island"—no doubt in one of the southeastern harbors or among the outlying islets—Thorfinn must have wished that he had kept on at first, like Leif, into warmer

¹ Lescarbot: *Nova Francia*. Erondelle's transl., pp. 101, 102.

latitudes, lived in comfort and held the whole party together. This seems to be his worst mistake, and Champlain has accounted for it abundantly.

I made diligent search and inquiry on Grand Manan, also inquired a little in Eastport, and it seems clear that there are no grapes worth mentioning about Passamaquoddy Bay, nor indeed anywhere near the Bay of Fundy. Southern New England is their farthest northern home in quantities and of size to be useful.

The sea-fishing, so particularly stated in the saga, is still the prime resource of the Passamaquoddy region including Grand Manan. In fact, except hay-making, there is hardly another resource of general value. Two or three thousand people of the island live by fishing in more than decent comfort, while on the nearby mainland there has been built up at Lubec the chief American center of one branch of this industry.

Considering the many coincidences of the present and past facts with the items of the saga and the absence of any real objection, it seems that Grand Manan and Passamaquoddy Bay with the strait between them may be accepted provisionally as Straumey and Straumfiord. But even if we err as to the exact places named in the saga, it seems practically certain that these were not far from the sweeping tides of Fundy. The Icelanders could not come into this region without observing them, and how could they pass by, giving such titles to lesser examples of the same kind? The verbal distinction between stream and current, sometimes suggested, must in this connection be regarded as overstrained. Besides, the official chart in its "rips" and "eddies" offers an abundance of "stream," and Dr. Fewkes characterizes them clearly in his zoölogical paper already cited.

It may be well to consider as an alternative, Long Island on the opposite side of the mouth of the Bay of Fundy, and the narrow passage, now St. Mary's Bay, between it and the mainland of Nova Scotia, where Champlain found a violent and dangerous current. But the island seems too close to the mainland for the language of the saga, since the passage could be easily and promptly made at any season; and it is hardly a sufficiently distinguishable "region."

15.—THE EXPEDITION TO HÓP

After the departure of Thorhall the Hunter, and Thorfinn's decision "to proceed southward along the land and to the eastward," the saga says:¹

¹ A. M. Reeves: *The Finding of Vineland the Good*. Translation of saga continued. See footnotes.

It is now to be told of Karlsefni, that he cruised southward off the coast, with Snorri and Biarni, and their people. They sailed for a long time, and until they came at last to a river, which flowed down from the land into a lake, and so into the sea. There were great bars at the mouth of the river, so that it could only be entered at the height of the flood-tide. Karlsefni and his men sailed into the mouth of the river and called it there Hóp. They found self-sown *wheat-fields* on the land there, *wherever there were hollows, and wherever there was hilly ground, there were vines*. Every brook there was full of fish. They dug pits, on the shore where the tide rose highest, and when the tide fell, there were halibut in the pits. There were great numbers of wild animals of all kinds in the woods. They remained there half a month, and enjoyed themselves, and kept no watch. They had their live-stock with them.

Now one morning early, when they looked about them, they saw nine skin-canoes, and staves were brandished from the boats, with a noise like flails, and they were revolved in the same direction in which the sun moves. Then said Karlsefni "What may this betoken?" Snorri's son Thorbrand, answers him: "It may be this is a signal of peace, wherefore let us take a white shield and display it." And thus they did. Thereupon the strangers rowed toward them, and went upon the land, marvelling at those whom they saw before them . . . [For description see p. 143 herein] and then rowed away, and to the southward around the point.

Karlsefni and his followers had built their huts above the lake, some dwellings were near the mainland, and some near the lake. Now they remained there that winter. No snow whatever came there, and all of their live-stock lived by grazing. And when spring opened, they discovered, early one morning, a great number of skin-canoes rowing from the south past the cape, so numerous, that it looked as if coals had been scattered broadcast out before the bay; and on every boat staves were waved. Thereupon Karlsefni and his people displayed their shields, and when they came together, they began to barter with each other. Especially did the strangers wish to buy red cloth, for which they offered in exchange peltries and quite grey skins. They also desired to buy swords and spears, but Karlsefni and Snorri forbade this. In exchange for perfect unsullied skins, the Skrellings would take red stuff a span in length, which they would bind around their heads.¹ So their trade went on for a time, until Karlsefni and his people began to grow short of cloth, when they divided it into such narrow pieces, that it was not more than a finger's breadth wide, but the Skrellings still continued to give just as much as before, or more.

It so happened that a bull, which belonged to Karlsefni and his people, ran out from the woods, bellowing loudly. This so terrified the Skrellings, that they sped out to their canoes, and then rowed away to the southward along the coast. For three weeks nothing more was seen of them. At the end of this time, however, a great multitude of Skrelling boats was discovered approaching from the south, as if a stream were pouring down, and all their staves were waved in a direction contrary to the course of the sun, and the Skrellings were all uttering loud cries. Thereupon Karlsefni and his men took red shields and

¹ W. H. Dall: *The Tribes of the Extreme Northwest*, p. 238. Exact parallel in early trading. See also as to red headwear in southern New England, a later quotation from Champlain.

displayed them. The Skrellings sprang from their boats, and they met then, and fought together. There "was a fierce shower of missiles, for the Skrellings had war-slings." Karlsefni and Snorri observed, that the Skrellings raised up on poles a great ball-shaped body, almost the size of a sheep's belly, and nearly black in color, and this they hurled from the pole upon the land above Karlsefni's followers, and it made a frightful noise, where it fell. Whereat a great fear seized upon Karlsefni, and all his men, so that they could think of nought but flight . . . for it seemed to them, that the troop of Skrellings was rushing towards them from every side, and they did not pause, until they came to certain jutting crags where they offered a stout resistance. Freydis came out, and seeing that Karlsefni and his men were fleeing, she cried: "Why do ye flee from these wretches, such worthy men as ye, when, me-seems, ye might slaughter them like cattle? Had I but a weapon, methinks, I would fight better than any one of you." They gave no heed to her words. Freydis sought to join them, but lagged behind, for she was not hale; she followed them, however, into the forest, while the Skrellings pursued her; she found a dead man in front of her; this was Thorbrand, Snorri's son, his skull cleft by a flat stone; his naked sword lay beside him; she took it up, and prepared to defend herself with it. The Skrellings then approached her, whereupon she stripped down her shift, and slapped her breast with the naked sword. At this the Skrellings were terrified and ran down to their boats, and rowed away. Karlsefni and his companions, however, joined her and praised her valor. Two of Karlsefni's men had fallen, and four of the Skrellings. Karlsefni's party had been overpowered by dint of superior numbers. They now returned to their dwellings, and bound up their wounds, and weighed carefully what throng of men that could have been, which had seemed from the land; it now seemed to them, that there could have been but the one party, that which came from the boats, and that the other troop must have been an ocular delusion. The Skrellings, moreover, found a dead man, and an axe lay beside him. One of their number picked up the axe, and struck at a tree with it, and one after another [they tested it], and it seemed to them to be a treasure, and to cut well; then one of their people hewed at a stone and broke the axe; it seemed to him of no use since it would not withstand stone, so he cast it down.

It now seemed clear to Karlsefni and his people that although the country thereabouts was attractive, their life would be one of constant dread and turmoil by reason of [the hostility of] those who dwelt there before, so they forthwith prepared to leave, and determined to return to their own country. They sailed to the northward off the coast, and found five Skrellings, clad in skin-doublts, lying asleep near the sea. There were vessels beside them, containing animal marrow, mixed with blood. Karlsefni and his company concluded that they must have been banished from their own land. They put them to death. They afterwards found a cape, upon which there was a great number of animals, and this cape looked as if it were one cake of dung, by reason of the animals which lay there during the winter. They now arrived again at Straumfiord. . . .

It will be instructive to consider this return journey first and in reverse order. The nearest point down the coast from Straumey recorded by the saga is of course the headland covered by the animals. No doubt they were seals, for no land animals would congregate in

such numbers in such a place. At the mouth of the Bay of Fundy on one of the Tusket Islands Champlain in 1604 "found the shore completely covered with sea wolves," his name for the queer creatures, which still are fairly common in the region. It is not surprising that Thorfinn should find a little below Grand Manan what the Frenchman afterward found a little above. But this would be a much more likely spectacle in the cold waters of the upper Maine coast than farther southward. Any one of the jutting rock-islands or promontories north of Casco Bay might probably answer.

The three Skrellings were found before finding the seal as the party came northward, so they must have been farther south. "Lying asleep near the sea" gives the idea of a smooth beach, and would belong rather to southern or middle Maine or some lower point, though not inevitably. Their "food" was perhaps rather a relish, for Strachey tells us: "Nottowene groweth as our bents do in meadows, the seed of which is not unlike to rye though somewhat smaller; these they use for a dainty bread buttered with deer suet,"¹ This may be the earliest record of buttered rice cakes.

Their costume is more to the present purpose, buckskin jackets being Indian attire wherever not discarded for coolness. Champlain observed in this matter an interesting distinction between the regions above and below Cape Ann—the former being chilled by the northern current, the latter warmed by the Gulf Stream, so that the waters of the two shores of the projecting land are still recognized by residents as of different temperatures. Writing of Nauset and other more southern points visited in 1605,² he says; "All these people from the Island Cape (Cape Ann) wear neither robes nor furs except very rarely, moreover their robes are made of grasses and hemp, scarcely covering the body and coming down only to their thighs." Ordinarily, he reports, they wore only "a small piece of leather, so likewise the women, with whom it comes down a little lower behind than the men, all the rest of the body being naked." The next year at Chatham Harbor in this region "some five or six hundred savages" came to see him, "all naked except" that "small piece of doe or sealskin. The women are also naked. They wear their hair carefully combed and twisted. Their bodies are well proportioned, both men and women, and their skin olive-colored." He has already told of the robes worn in July at Saco near the least chilly corner of Maine, but

¹ W. Strachey: *The Historie of Travaile into Virginia*, p. 118.

² *Voyages of Champlain*. Original Narratives of Early American History, p. 73.

of course above the Cape, which were all the villagers had to sell, "for they preserve only such furs as they need for their garments." He also mentions "robes and furs," and no nakedness, at points farther north. It is like comparing the costumes of a temperate and a tropical zone, though of course the real difference was much less.

It is not denied that Verrazano tells of visits by deerskin clad "Kings" in Narragansett Bay, nor that Champlain says of the Nauset women "When they came to see us they wore robes which were open in front. I saw among other things a girl with her hair very neatly dressed with a red-colored skin and bordered on the upper part with little shell beads." But full dress is never a daily habit at all hours nor a measure of climatic requirements; and a jacket open in front plus a bead-trimmed turban, with nothing more above the waist, can hardly be called overwarm in the way of a visiting costume.

The precise border-line between the regions of habitual clothing and approximate nudity (for everyday wear) may have shifted a little during the six centuries between the dates of Thorfinn and Champlain by reason of the descent and dwindling of Cape Cod and possible consequent changes in the course and interaction of oceanic currents. But there does not seem to have been much difference during nearly four centuries that have followed; and probably there was little before. Whether the New Hampshire and lower Maine coast were a little warmer or a little chillier in 1003 than in 1605 or 1911, it is altogether likely that the buckskin-shirted victims died above Cape Ann, though perhaps below the Kennebec. At a later period this would be the place to find Almachouqui Algonquians; and perhaps this is the best guess we can make about them; but it remains a guess only.

On the earlier downward passage to Hóp, Thorfinn would seem to have briefly followed the coast, say as far as Mount Desert, and then struck across the Gulf of Maine, thus sailing chiefly on a more eastern course than if he had followed the shore all the way. This crossing might be to or around Cape Cod, or, less probably, to lower Maine. Birds in migration during two seasons,¹ and other signs not to be missed by the watchfulness of a very well-skilled early navigator, would have set him on that more direct water-road. Even the brief tracing of the nearer shore would not necessarily be carried into practice, for he had nothing to gain by it, aiming so far away.

¹ See account by Columbus of his first voyage for the aid thus given the Genoese in finding the Azores.

The choice of routes has always existed, and was promptly made known to every explorer. Hudson seems to have cut across from the Penobscot to Nantucket. Champlain tells us of the expedition in 1606: "It was decided to continue the voyage along the coast,"¹ but "it would have been much better to cross from where we were directly to Mallebarre (Nauset), the route being already known, and then use our time in exploring as far as the fortieth degree or farther south." How they learned that route is not clear, for their previous voyage to and from the same point had been strictly along shore or from headland to headland. But they had at least the same means of information as Thorfinn, and the course suggested by Champlain is almost exactly one which we have conjectured for the earlier navigator, though a change of angle would have taken him to Boston instead, or even to Portsmouth.

There is another consideration which perhaps has never before been presented. The natives who fought with them at Hóp did not attack them at Straumfiord after their return. There is no indication that they were followed at all. Doubtless they could not be, if they sailed out of sight at the start, afterward passing only from one headland to another. But if the voyage had been for a hundred miles only, the savages would have found them out and tried to take revenge—a matter of imperative duty and personal enjoyment for most wild Indians.

There is another clue. The saga, as already quoted, relates a subsequent expedition of Thorfinn with one ship, around Cape Breton Island to a river flowing from east to west, where Thorvald, the helmsman was slain by a "one footer" or "Uniped." We are told "They concluded that the mountains of Hóp and those which they had now found formed one chain (or were the same)," and this appeared to be so, because they were about an equal distance removed from Straumfiord in either direction. They intended to explore all the mountains, those which were at Hóp, and those which they discovered. They sailed back and passed the third winter at Straumfiord." The intention to "explore all the mountains" is not in the Saga of Thorfinn Karlsefni, but in the parallel Saga of Eric the Red (A. M. 557), as given by Mr. Reeves's notes, and the estimate of equal distance is in the former only. It sounds authentic, but merely as a sailor's guess.

It must mean sailing distance, for they were not given to guessing at overland air-lines, which they would never follow; but measured by "doegr" of water travel. Without knowing which river is meant,

¹ Voyages of Champlain, Orig. Narr. of Early Amer. Hist., p. 81.

and just how loosely they made the comparison, it is impossible to estimate more nearly. The application of the distance measure as a means of identification is not obvious unless the elevations were thought of as visible from both sides of a peninsula. This would put Hóp in Nova Scotia as Dr. Storm tried to do; but the climate, the absence of large wild grapes and the fact that Hóp was a long way below Straumey (Grand Manan) all forbid. Moreover the highest elevations in Nova Scotia, the Cobequid hills, though doubtless visible from the Gulf side, have only a maximum height of 1100 feet; and are a long way from the Atlantic shore, with, also in part, the upper arms of the Bay of Fundy between. If we carry the mountains in question up to the lower ridge of the western horn of Cape Breton, we pack nearly all the sites of the saga impossibly near to each other, we dispense with the distinctive violent currents of Straumey and the pleasing conditions of Hóp and we make the interval so slight that the party might have walked easily across or sent messengers, and could not possibly have felt themselves astray in a remote and dangerous region as they did. Also the Uniped or his friends would have followed them; but nobody menaced them on Straumey nor in their mainland home on the shore of the bay beyond Straumfiord, so far as we know. It must not be overlooked, however, that the statement of distances from Straumfiord occurs in one version only and may be a conjectural explanation by some saga-man of several centuries later.

Of course there must have been something unique about this one-footer, who fled so fast after shooting so deadly. Perhaps he was a wandering Eskimo with a kayak hidden in that "creek" where he vanished. If he sprang into that odd little craft and shot out of sight with the tapering rear end of the boat reaching back from his waist, and if this were their first clear view of him after woodland glimpses, the picture might have impressed them in that way, making them hurry out of a land of sorcery and death.

Lescarbot,¹ after describing a kayak as "all covered with leather" except "one hole in the midst where the man putteth himself on his knees," adds very appositely: "I believe that the fables of the sirens and mermaids come from the dunces esteeming that they were fishes, both men and women." In other words, he recognized that the rear part of the kayak might well be taken for a single member, a tail. If an Eskimo thus ensconced may be taken for a merman, why not for a "one-footer?" At least, I am not aware of any other explanation which is equally reasonable.

¹ Nova Francia. Erondelle's transl., p. 231.

It is interesting to follow these early visitors in even their slight exploration of the shore of that vast Gulf of St. Lawrence, which, with the Unipéd, so weighed on their disquieted fancy; but we cannot gather anything as to distance or previous locality more than has been stated already. The calculation or conjecture simply bears out the statement that "they sailed for a long time" in their previous nearly equal journeying across the Gulf of Maine.

The commendations of their second Wineland home—"the country was attractive," "every brook was full of fish," "no snow whatever," and the like—may be taken with a slight allowance for hyperbole in matters of detail. Why should not these Norsemen speak a little loosely in praising, as well as other people? Many brooks, if not all, are really crowded with some kinds of fish in the spawning season along the coast. Yellow perch were formerly dipped out of them in quantities east of the Chesapeake; herring are often snagged by the hook or scooped up with the dip-net when they throng the water at the Little Falls of the Potomac, and alewives are said to run in multitudes up Narragansett Bay. The special method of catching flounders (which hug the bottom) in pits between tides is said by Munro's *History of Bristol*¹ to be still in practice there. As to the game, I was told of several recent instances of deer being seen near Mount Hope, and the region must once have been a hunter's paradise. There are years when, by all accounts, hardly any snow falls in this neighborhood, and Thorfinn may have happened on one of these.

The winter-grazing of stock has been claimed in one of the sagas for an especially bountiful field—the prize of a murderous controversy—in Iceland itself. More precisely, a recent writer² bears witness:

The Faroe Islands, surrounded by rocky barriers and dangerous whirlpools, are like those dragon-guarded islands of fable upon which, when the circle of enchantment was passed, the invader found pleasant gardens and balmy airs. . . . The air of the islands is mild the year round, so that even in winter cattle and sheep are herded without shelter, and snow so seldom lies upon the land that the grazing is practically uninterrupted.

From this to the "absolutely no snow" of the saga is no great interval. Perhaps in all such cases we should suspect a slight involuntary "diminution of the record."

This winter grazing, as a ranchman of the far northwest informs me, is practised even in Alberta, where the weather varies quite suddenly from Arctic severity to a very trying heat and moisture.

¹ W. H. Munro: *History of Bristol*, R. I., p. 22.

² E. M. Bacon: *Henry Hudson*, p. 112.

On Nantucket, which is bleak in winter, sheep are often left thus uncared for, as well as on both sides of Narragansett Bay, according to the correspondence appended to Rafn's huge Latin book. Also, the Chincoteague ponies of the Maryland and Virginia shore have supported themselves independently for much more than a century, though there is some zero weather in most winters, if only for a day or two. The question is one of food rather than temperature, and there is usually food for ruminants in the marshes. When the coast line of Narragansett and Massachusetts Bays was lower than now we may suppose that marsh-grazing was much more plentiful.

There is a plain intention in this part of the saga to contrast the conditions of their northern and southern Wineland homes in the months that try all resources. Champlain¹ does the same as between the same localities. Besides his statement that no one would foresee the severity of the St. Croix winter from the summer of that region (compare with the saga) he says that the winter life of the few Indians there "seems a very miserable one." He tells of really murderous hardships endured by his own companions. But at Nauset he was told that the snow fell only to the depth of a foot or less, and he adds; "I conclude that this region is of moderate temperature and the winter not severe." Now the Nauset Indians were close neighbors and allies of those about Massachusetts and Narragansett Bays and their conditions must have been nearly identical.

As to the delightfulness of the Narragansett country we have Verrazano's panegyric of nearly a hundred years before, which declares that it will produce anything; also the commendation of many later writers and the plain testimony of the land and water themselves.

Thorfinn and his party met their first grape-vines and wild grain at Hóp, so far as we know, for we can hardly count the plants which Haki and Hækia may have reached in their dubious southern excursion. The impression was great and immediate. We are told "They found self-sown wheat fields on all the land there wherever there were hollows and wherever there was hilly ground there were vines." Not grain nor grapes at that season, for it was spring, and no interpolator has been at work here. The statement would have fitted many places in southern New England, so far as the vines are concerned, and one place about as well as another. As already explained, it would not fit any more northern coast region.

Three grains have been called "wheat" in America, which are not really so. Prof. Fernald's² *Elymus arenarius* (lyme grass, strand

¹ Voyages of Champlain: Orig. Narr. of Early Amer. Hist., pp. 25-96.

² Fernald: The Plants of Vinland. Rhodora, Feb. 1910.

wheat, or "strand oats") has had many names. It is a botanical curiosity in northern New England and the Maritime Provinces; rather plentiful along the sea shore of Labrador; and perhaps even yet used a little in Iceland. But why should these northern people announce as a novelty and a godsend what they already had at home? Besides, it will not go with the grapes at all. And to make Labrador do duty for Wineland as well as Helluland and Markland is really asking too much of a poor and distressful region.

Maize, or our Indian corn, originated—according to Dr. Harshberger's very careful and valuable investigations¹—in the uplands of central Mexico; whence it has been carried north and south a long way, everywhere calling for the care of man. Dr. Rafn supposed that it might have been found wild in Rhode Island, but that is out of the question. Leon, Mexico, would be the nearest possible point. A grain accidentally dropped by us may spring up, and if it be early in the season, may produce grain, but that, if it falls again, will die during the winter. This is true from Maryland northward, at the least; for *Zea mays* is an upland tropical exotic and helpless among us while untended.

It may have reached and passed the Bay of Fundy, for Lescarbot² speaks of agriculture as formerly practised by the Micmac. It was doubtless receding when found by Champlain³ at Saco in 1605, for on the Kennebec the Indians had told him of its cultivation along that part of the coast a little earlier. There is the same story to tell of Hochelaga⁴ (Montreal), where Cartier found it plentifully in 1535, yet whence it was driven, before the next European visit, with its Huron planters. The predatory habits of idler savages counted for more than the rigor of the climate in fixing boundaries. Yet there is no doubt that it needs a hot and rather long summer to really thrive and yield well.

One would hardly expect it to be called "wheat," but men often name by analogy, not by supposed identity; as in the familiar instances of the tulip-tree "poplar," our robin, which is a migratory thrush, the ruffed grouse, which is a partridge in some States and a pheasant in others, and the "bobwhite," which is called a quail wher-

¹ J. W. Harshberger: *Maize, A Botanical and Economical Study*. University of Pennsylvania Publications, 1893.

² *Nova Francia*: Erondelle's transl.

³ *Voyages of Champlain*, Orig. Narr. of Early Amer. Hist., p. 60.

⁴ He had previously seen the grain, as food, near the mouth of the St. Lawrence and called it "millet as large as peas." A little earlier he had met the wild rice on the Southern Shore of the Gulf, noting that it was "like rye."

ever it is not (more accurately) called a partridge. Similarly Cartier called this grain millet.

So Strachey's¹ Virginia tells us:

The natives here have a kind of *wheat* which they call poketawes, as the West Indians call the same maize. The form of it is a man's tooth, somewhat thicker, for the preparing of the ground for which they use this manner. He then proceeds to describe girdling the forest trees, killing the roots with fire, grubbing up the dead stumps next year, planting three or five grains of *wheat* and one or three of beans in the ashes and decayed wood, the hills being four or five feet apart, weeding with hoes, hilling and the final processes of pulling and preparation, with a word also for green roasting ears.

Champlain more briefly describes the same process in New England, specifying some additional tools.

So "corn" may be "wheat"; but the real crux is in the word "unsown," evidently meaning wild, spontaneous. Dr. Fiske thought the Norsemen, seeing the small amount of work required, considered it practically so; but the above abstract of procedure ought to dispose of this rather curious fancy, which would not have occurred to him if he had raised corn on a wooded hillside experimentally in the Indian way. Besides, though a wheat-field resembles a natural field or patch of low-growing wild grain, a cornfield is obviously artificial. Dr. Fiske says that it was naturally noticed by Thorfinn's people, being one of the first objects to attract the attention of Champlain. But Champlain's first observation is: "They till and cultivate the soil. I landed to observe their tillage. . . . We saw their Indian corn, which they raise in gardens," and again, "before reaching their cabins we entered a field planted with Indian corn." Whenever he mentions this plant or its grain, it is unequivocally as an attendant on human homes and the product of human labor.

No doubt the Norsemen would have done likewise, if "Indian corn" were the "wheat" which they found; but there is not a word in the sagas to indicate any sign or product of agriculture past or present—even of the "pulse" which Verrazano found the Narragansett natives cultivating, whatever he may have meant.

This interesting omission of the saga would have a negative value in determining the general location of Hóþ, if we knew that corn was then raised in any particular region which Thorfinn might have reached. But the chances are that it had not yet entered New England from beyond the Hudson. It was there in the early seventeenth

¹ W. Strachey: *The Historie of Travaile into Virginia*, p. 116. Cf. Lescarbot: *Nova Francia*. Erondelle's transl., p. 98. "A loaf of bread made with the wheat called mahiz or mais and in these our parts Turkey or Saracen wheat."

century, and perhaps even in 1500; but this leaves a margin of five centuries for its advent. Even if it were plentiful in 1000 a little beyond the Allegheny Mountains, it might not have crossed them. We do not know how fast it was carried, nor what conditions favored and what opposed it.

The wild rice naturally grows in wet "hollows," a very significant word in the saga. There are square miles of it along almost every one of the Maryland rivers. In the northwest it is equally plentiful and put to better use. Indian wars have been waged for the best gathering grounds. Many thousands of Indians depend in some degree on it for subsistence. The tending and gathering of it runs close to agriculture, so elaborate a system has developed—very fully set forth in the memoir of Dr. Jenks.¹

In its later stages it does not greatly resemble wheat, but when young there is a decided resemblance to the ordinary unbotanic eye, though its tint is softer and more luxuriant, making its great low fields a conspicuous feature of our spring landscapes. There is plenty of it in Texas, and thence all the way north as far as the low sandy typically American coast line extends; also farther north, where proper surface conditions obtain, even to a high latitude. It is equally at home, equally abundant, in Maryland and Manitoba. In "The Backwoods of Canada" Mrs. Traill reports "When seen from a distance they (the wild rice beds) appear like low green islands on the lakes." But they do not need continually even partial submergence, being only a little more nearly aquatic than cultivated rice, which must have the water let in now and then. I have tramped often about and upon the wild rice roots, after the birds that fatten almost absurdly on this grain, which is "like rye" as to height and some other characteristics in full plant-growth as Cartier says.

Climate and other conditions exclude perhaps all the territory north of Cape Ann, but hardly any place below it, near the coast. We must look next to the requirements of Hóp's topography as set forth in the saga.

The general meaning of the word is a loch or small bay. The map of Iceland² shows the particular Hóp which Thorfinn most likely had in mind and thus illustrates the description. It is a lake not very far from his home, connected by a strait to the broad bay Huna-

¹A. E. Jenks: *The Wild Rice Gatherers of the Upper Lakes*. Nineteenth Ann. Rep. Bur. Amer. Ethnol., part 2, p. 1013 *et seq.*

²W. G. Collingwood and J. Stefánsson: *A Pilgrimage to the Saga-Steads of Iceland*. But this does not show the sea connection made plain by larger maps.

floi running in from the sea. This strait or channel is practically a lower reach of the main river which flows down into the lake. There is also a tributary river or more than one which might be disregarded. Some of the maps seem to indicate that there would probably be a shoal or bar in the strait or river between bay and sea. All this is in accord with the words of the saga, concerning the American Hóp which they visited and named.

Some additional facts are mentioned. Indians rounded a cape in approaching "from the south." There were hills nearby and crags a little way up the river. There was a point or cape at the entrance to the bay. There were flats or hollows for the wild rice, as already noticed. It will be seen that there are many requirements. We simply cannot find anything to fit them even plausibly south or west of Narragansett Bay. Is there anything like Hóp between it and Cape Ann? Or rather was there any such Hóp there in 1004?

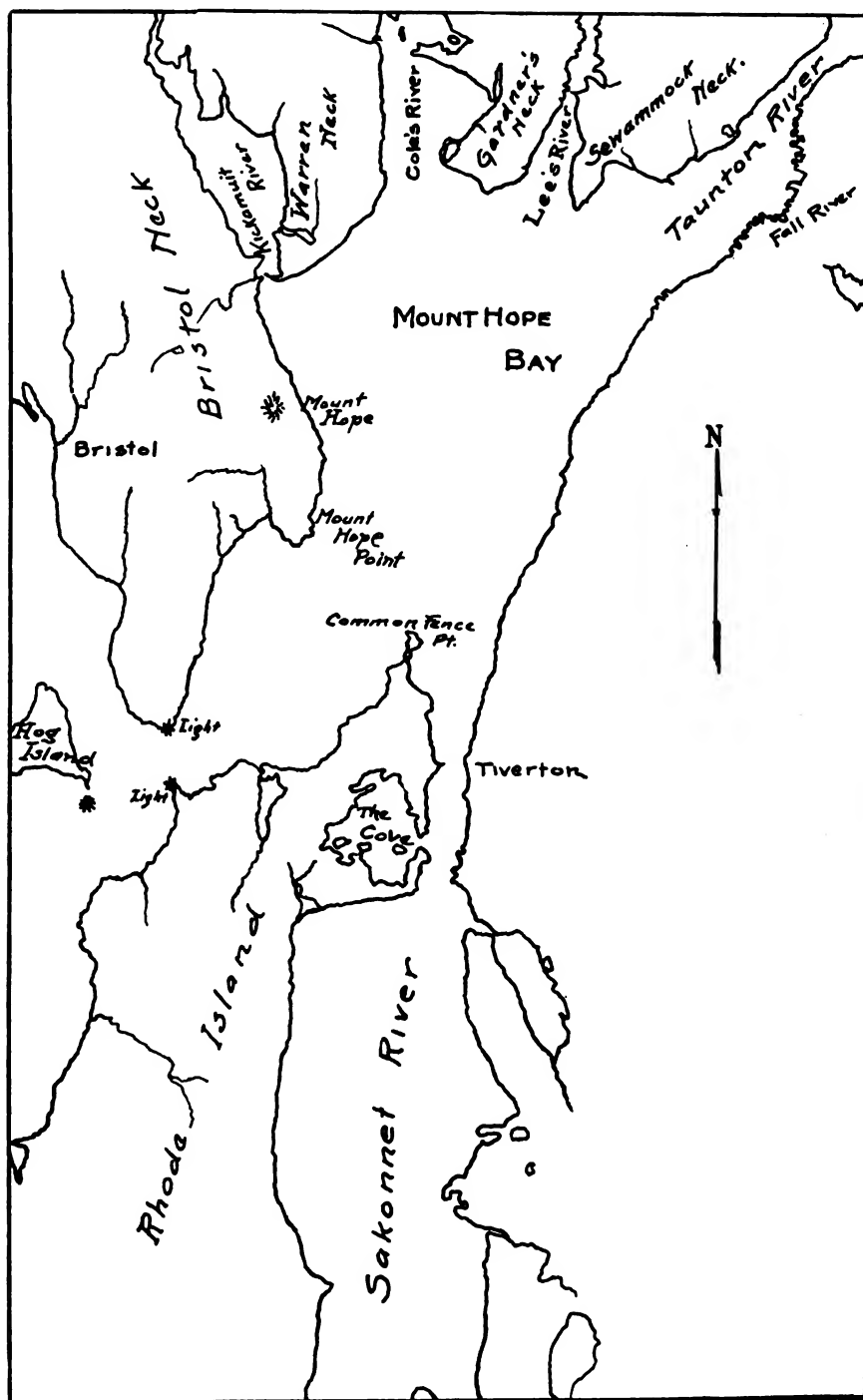
Professor Horsford thought he found an eligible Hóp in the Back Bay of Boston Harbor; also the delightful anchorage of Verrazano, where a fleet might be safe when storms do blow. But in Verrazano's time there was no such bay; far less in Thorfinn's.

As previously stated, the Superintendent of the U. S. Coast and Geodetic Survey informs me that the oldest chart to which he has access gives two fathoms for the ruling depth of the channel leading into the Back Bay and shows its flats without depth marks. Yet they may not have been wholly bare at low water, for they show on the chart like those of Dorchester, which are marked for four feet. This chart was drawn for the British government in the latter part of the eighteenth century. Obviously a fleet would have been sorely put to it for room in 1800; how then in 1523, allowing for the subsidence of the coast? In Thorfinn's time if not in Verrazano's, there can have been no more than a river winding through meadows all the way down to the harbor. This vanishing of the Back Bay Hóp makes any comment on the lack of elevations and crags beside the river seem rather superfluous.

Dr. Rafn¹ was so absurdly wrong as to so many things—in spite of the real service he rendered—that they will reflect in some minds injuriously on one point, as to which he may happen to be right. That is, the identification of Mount Hope Bay, Rhode Island, with Thorfinn's Hóp. It is a beautiful sheet, the depth of which in some parts is a guaranty against its entire absence then.

Taunton River flows into it at the upper end or side. From the lower end or opposite side two channels extend to the sea. One is

¹ *Antiquitates Americanæ*.



MOUNT HOPE BAY

known as Sakonnet River; the other as the eastern channel of Narragansett Bay. Aquidneck or Rhode Island lies between them. Bristol Narrows connects the above channel with Mount Hope Bay. Mount Hope is a little above the narrows near the bay side and affords a fine view over nearly the whole Narragansett region.

It has been objected that there are no bars, that a fleet may pass in without any difficulty. But the objectors lose sight of the different conditions probably obtaining then. No one can say just what the change in elevation has been during nine hundred years; yet there are some measures which have been taken recently, and there are earlier indications. The Dighton Rock inscription in Taunton River is wholly overflowed in ordinary tides; it was partly overflowed in high tides about 1700 when Cotton Mather wrote. We must suppose that it was entirely free of the tide and in no apparent danger when the figures were carven. Other inscribed rocks give like testimony. Mr. Davis's marsh experiments elsewhere cited are quite conclusive. Dr. McGee tells me that the depression at Atlantic City is found to be probably from two to four feet per century. It seems to be about that for Ocean City, Maryland, a point which I have watched for more than twenty-five years. A proven descent has occurred at New York and in Boston Harbor during the past seventy years. Of course we cannot be quite sure that this existed in older times, for reasons already given, but continuity of movement seems more probable than cessation, when there is no apparent reason for the latter. As we know of a sufficient cause for the continuous lowering of the southern New England coast, and that it has really descended during several centuries, we may at least be pretty sure that it was higher in the year 1004 than it is now; but by how many feet who can say?

Of course the action of tides and river-currents, in scouring out and in depositing, must also be kept in mind. For example, though parts of Mount Hope Bay near that hill are deep, the remainder of it seems to have been silted up by Taunton River and other tributaries, the soundings running below twenty feet. The shallows have been dredged through to make a clear channel. To get the soundings of the year 1004, we must suppose all this accumulation removed and the old elevation restored. Whether the net results would leave a Mount Hope Bay approaching its present size may be questioned; but there would be at least a small bay, unless the depression has amounted to seventy feet, which seems unlikely. A very much less descent would, however, make a bar in a curved line across the main channel where a vessel struck in 1912; would close the strait now called

Sakonnet River ; and would leave the Eastern Channel with its lateral branch, called Bristol Narrows, a good title to be called a river, as the popular equivalent for a strait. The steep Fall River hills would supply the crags called for by the saga, and the upper end of what is now Aquidneck Island would be the point on the southern side of the entrance, which the Indians passed in paddling from the south and returning the same way. There would be plenty of marshland for the wild rice.

It fits well in the main, but of course the rest would go for nothing without a loch-like bay of some size ; and this item looks more doubtful than if the present depth were generally greater ; yet that objection is probably not fatal. Verrazano seems to describe a transitional condition of Narragansett Bay, when its mouth did not freely let in so great a volume of water as now before the sweep of the storms. Curiously he does not allude to Mount Hope Bay ; but he does not allude to Mount Hope either ; so perhaps his trips by land and water were rather to the westward, or those who doubt his interesting story may be right though in most of its items there is a notable verisimilitude. Certainly the hill was there, small but dominating the low landscape.

The name Mount Hope is somewhat mysterious, but probably a corruption of Montaup ; which Mr. Mooney does not consider identical with Montauk, Manotuck or Montanutt, defined by Trumbull's¹ dictionary as meaning in substance a place of outlook. Montauk is at least applied to several hills, and its meaning would seem to fit the present one well enough. But the words may not be related. ¶

Now Munro's History of the town of Bristol, before referred to, a work rather notable for care in collecting local data from deeds and records, declares in a note that Haup and Montaup were applied by Indians to this region when the white settlers came. He offers the solution that the Norsemen left the name Hóp, which the Indians turned to Haup and the English to Hope as we now write it. He thinks two or three Norsemen may have remained and married among the Indians, thus anchoring the name ; an improbable supposition, considering the hostility of these natives, and one for which we have no basis whatever. The true explanation of the origin of the word must be left to our Indian linguists, who, however, are more conversant with surviving languages. No argument can be safely founded on it in the present state of our knowledge.

¹ J. H. Trumbull: Indian Names of Places in and on the Borders of Connecticut.

As against Mount Hope Bay, it must be said that the saga rather leaves the impression of an eastward-facing, nearly land-locked expanse, reached by natives who came up along the coast from the south; and that there is no reference to any course but a southern one in reaching it from Straumey, nor any but a northern one in returning. It is true that the narrative might have omitted, as not very important, the westward and eastward turns in rounding the corner of New England; but a spot on the eastern front of the latter has the advantage of requiring no such explanation. On the other hand, sites along this coast lack noticeable hills. Just what weight should be attached to each of these conflicting considerations is hard to say, but thus far no other Hóp has been suggested which seems more plausible than Mount Hope Bay, Rhode Island.

16.—CONCERNING THE NATIVES

In *The Discovery of America*, Dr. Fiske¹ has laid stress on the ignorance of eleventh century Europeans as to people so unsophisticated that they would not understand the qualities of a steel implement or the relative value of red rags and costly furs and who could be thrown into panic by the bellowing of a bull. Possibly the argument is pressed overmuch, for the civilized peoples of antiquity had, and transmitted, some knowledge of interior Africa and other outlying rudimentary regions; but, however qualified, it adds a little cumulative testimony to the genuine character of the saga. Also, these Skrellings have been found interesting by many writers and overhauled in every way, to see what they can tell us, for one thing, about the location of Hóp.

In particular, controversy has busied itself with the question, were they Indian or Eskimo? The case for the latter rests mainly on the name Skrelling or Skræling, which is known to have been applied to them centuries afterward, the "skin-boats," the slings, and certain physical characteristics. Its weakness lies chiefly in the absence of clothing at Hóp, of dogs and sleds, of winter traveling, of distinctively Eskimo appliances such as the kayak and harpoon, and of any indication of skill in carving; also in the fact that everything said of the Skrellings would apply to some Indians, who might have been there.

We have touched lightly before on the question of boundaries, yet may still add a word. We know the Eskimo only as an Arctic littoral people, ill content with a milder habitat and not thriving

¹ Vol. 1, pp. 180-185.

in it. All accounts go to prove them so wonderfully skilled in making the most of their situation that they must have belonged to it from rather ancient times though not necessarily in the New World. Rink¹ argued for their development from some Indian tribe and their gradual movement to the northern coast under pressure, there to become modified by circumstances and polar weather. Thalbitzer,² examining the question more recently, finds nothing conclusive in the reasoning. It seems at least as likely that they were here before the Indians, at least before the ancestors of any of those stocks of North American Indians which concern us or they may have come in after them from Asia as some suppose. They have often clashed in defence with Athapascan or Algonquian tribes, sometimes, though rarely, have taken the aggressive; and occasionally a particular district has been alternately occupied or overrun by one or the other contestant. But in the main it must be said that the Eskimo have been content to hold their ground along shores not desired by other people, and are to be considered as doing so from choice, not because driven thither and held there by enemies. Woods and warmth have never tempted them in historic times. While the ice-cap border was moving northward, we may suppose a slow shifting of their southern limit in the same direction. After the ice-cap was quite gone from the mainland, they dwelt still on those northern shores which gave them the life that they know. Sometimes they moved southward along these shores a little way, regaining regions of their former occupancy as to the coast-line only.

Packard³ says "When the French first frequented the coast, it was in possession of the Equimaux as far up as the end of Anticosti. Apparently they had not been long in possession." They seem also to have been contending for a foothold on Newfoundland, but it was never more than precarious. There are also a few slight and doubtful indications that parties of them landed on the northern shore of New Brunswick. It is their utmost southward point, even of reconnoissance or exploration, so far as we know; and if Professor Packard's⁴ inference be right, they would have been more remote before the movement of which he tells us. Undoubtedly they may have come southward before; but they would not wish to come far,

¹ H. J. Rink: On the Descent of the Eskimo. Arctic Papers for the Expedition of 1875, pp. 271-273. Journ. Anthr. Inst., 1872.

² W. Thalbitzer: The Eskimo Language, p. 21.

³ Packard: The Coast of Labrador, p. 260.

⁴ W. Thalbitzer: The Eskimo Language, p. 20.

this would be hardly practicable; and there is not the least sign that they came at all. If we consider the Skrellings to be Eskimo, we must suppose Hóp to be in Labrador or Newfoundland, where there are no grapes and no balmy winters and where the coastal geography of the sagas fails to apply. The Eskimo are all north of Hamilton Inlet now.

The earlier students of the subject were dominated by the idea that "Skrelling" must mean Eskimo. Putting this with the evidence for a warm Hóp, they got some curious results. Thus Schoolcraft,¹ adding yet a little more in the way of assumption, declared that successive conquests and revolutions in the Valley of Mexico sent corresponding waves of mankind northeastward by way of Tampico, till at last they drove out of New England the Skrellings whom the Norsemen found there. This may be paired off with the Arthurian conquest of Iceland, as a bit of theoretical ballooning.

Dr. Fiske² no doubt presents the kernel of the matter in reminding all that we do not assert the identity of Fuegians and Australians by calling them savages. The meaning of the word (weaklings) seems to have been about that among the Norsemen.³ We find them applying it not only to their Hóp visitors, but to the men in "doublets" found at a distant point, and to the bearded Marklander and his companions, with no thought of ethnological distinctions, but in mere facile disparagement. What else could be their view of the poor people who had no ships nor woven fabrics, no jewels nor armor, no live stock nor grain, nor steel weapons, nor good tools, nor money, nor proper European clothing; dusky people too, not pleasing in northern eyes? Such were contemptibly insignificant; it was hardly worth while to distinguish differences among them.

Dr. Nansen may be right in thinking that the name (like that of Finn for Laplanders and, as he points out, two other inferior peoples) came to have an implication of mythical beings or of magic; but the fact is irrelevant.⁴

The natives who visited them at Hóp were their very first specimens, and the Norsemen fitted the word to them in the spirit which applies derogatory nicknames like *injun*, *nigger*, *dago*, and *sheeney* to people despised by the utterer. It was then ready for any others of like status, and might even be applied conjecturally, by a loose

¹ Schoolcraft: *Indian Tribes of the United States*. Drake's edition, vol. 6, p. 84.

² J. Fiske: *The Discovery of America*, pp. 181-185.

³ Fr. Nansen: *Eskimo Life*.

⁴ In *Northern Mists*, vol. 2, pp. 11-20.

analogy, in advance of discovery. We can see the process at work after a hundred years in the surviving *Libellus* of the *Islendingabók*, written by Ari the Wise, who was no doubt the best informed man in Iceland. Here is the passage: "This country which is called Greenland was discovered and colonized from Iceland. Eric the Red was the name of the man, an inhabitant of Breidafirth who went thither from here and settled at that place which has since been called Ericsfirth. He gave a name to the country and called it Greenland and said that it must persuade men to go thither if the land had a good name. They found there, both east and west in the country, the dwellings of men and fragments of boats and stone implements such that it may be perceived from these that that manner of the people had been there who have inhabited Wineland and whom the Greenlanders call Skrellings. And this when he set about the colonization of the country was 14 or 15 winters before the introduction of Christianity here in Iceland, according to which a certain man who himself accompanied Eric the Red thither, informed Thor-kell Gellison."

Broken boats, tools, and dwellings defined as savages (*Skrellings*) the former occupants, who had probably withdrawn to the northward¹ or kept at home there, refraining from southward journeys and therefore they were presumably like the other *Skrellings* already encountered in Wineland. In other words, the Winelanders were not called *Skrellings* because there were Eskimo already known, but the Eskimo, long before they were seen, were called *Skrellings* by conjecture, because the word had come to Iceland traditionally from American adventures then a century old. Of course the two kinds of *Skrelling* (savage) might be utterly dissimilar, according to our modern standards.

Perhaps it was in the twelfth century,² perhaps not till the thirteenth century, that Norse hunters in upper Greenland met small "*Skrellings*," who used stone knives and whalebone arrowheads—Eskimo undoubtedly—as related by a manuscript discovered in Scotland in the nineteenth century.³ The greater Greenland landowners had hunting lodges, as we may call them, at the north, and kept ships to sail there; so such contact must happen at last.

In the year 1266 an expedition was sent to find out about them, as before mentioned, and seems to have gone very far north, indeed

¹ Fr. Nansen: *Eskimo Life*, Chap. 5.

² G. Storm: *Studies on the Vineland Voyages*.

³ W. Thalbitzer: *Eskimo Language*, p. 22.

nearly to Jones's Sound, judging by its primitive astronomical data; though Thalbitzer¹ supposes that they did not pass the site of Upernavik. At all events they found Skrelling houses here and there above the region inhabited by white men.

According to Dr. Storm,² the settlers "apparently afterward killed them or drove them away when they could." This looks as though the colony were expanding in that direction, or the Eskimo were beginning an ominous downward movement.

Professor Olson's preface to *Original Narratives*, etc., before mentioned, says that "The *Speculum Regale* was written in Old Norse in Norway in the middle of the thirteenth century," that it discusses in a dry, matter-of-fact way divers Greenland matters, like insularity, the aurora borealis, glaciers, climate, the fauna, exports and imports, and the means of human subsistence, but has not a word for the Eskimo. Surely the writer knew nothing definite about them, although some border settler might have been able to tell him.

It was the year 1337 at the earliest when Ivar Bardsen went with a relief expedition to the western settlement, a little too late. His narrative, written later in Norway, shows that the Greenland colonists can have had no considerable contact with the natives before the fourteenth century. The Icelanders can have had no idea of them at the time Hauk's book was copied, still less a hundred years earlier when the saga was written. Neither Thorfinn, nor the unknown saga-man, nor the Lawman Hauk, who gives us the earliest surviving manuscript, can reasonably be charged with using Skrelling in the special sense of Eskimo. If the Hóp natives are to be held Eskimo, it must be on other evidence.

The Saga of Eric the Red (A. M. 557) says: "They were small men and ill looking, and the hair of their heads was ugly. They had great eyes and were broad of cheek." The Saga of Thorfinn Karlsefni substitutes "swarthy" for "small." The Flateybook Wineland Saga states that the native chief was tall and of good figure.

Stature and comeliness make an uncertain reliance. The Eskimo are not all squat people. Those of southern Greenland are said to be taller than those in the north. The Long Labrador Trail of Dillon Wallace tells us:

In our old school geographies we used to see them pictured as stockily built little fellows. In real life they compare well in stature with the white man of the temperate zone. With a few exceptions, the Eskimo of Ungava average over five feet eight inches in height with some six footers.

¹ *Op. cit.*, p. 23.

² *Studies on the Vineland Voyages*, pp. 307, 370.

Concerning the "Northerners," a remote unsophisticated branch of the Innuït, occupying the northwestern peninsula of the same mainland region, Mr. Turner¹ informs us: "These people are unusually tall and of fine physique. The men are larger than the average white man, while the women compare favorably in stature with the women of medium height in other countries." E. W. Nelson² says:

The Malemut and the people of Kaviak peninsula, including those of the islands in Bering Strait, are tall, active, and remarkably well built. Among them it is common to see men from five feet ten inches to six feet tall.

Yet

The Eskimo from Bering Strait to the lower Yukon are fairly well-built people, averaging among the men about five feet two or three inches in height. The Yukon Eskimo and those living southward from the river to the Kuskokwim are, as a rule, shorter and more squarely built . . . and all of the people in the district about Capes Vancouver and Romanzof, and thence to the Yukon mouth, . . . all are very short.

Of the Norton Sound Eskimo, Dall³ writes that he has often seen both men and women six feet high and that some of the men are still taller. Also that the men have great strength, one being able to take a hundred pound bag of flour in each hand and another by his teeth and walk off thus burdened.

As to the eyes in particular, he reports that they are "small, black and almost even with the face," also that the "women are sometimes quite pretty." Lieutenant Holm⁴ admits that Eskimo have not large eyes, but asserts the same of Indians, disqualifying both; yet the Skrellings were natives of some kind. Captain Robinson,⁵ as quoted at second hand by Patterson in his valuable little work, described Mary March, a Beothuk prisoner, as having black eyes, "larger and more intelligent than those of the Eskimo." The two types were neighbors and naturally chosen for comparison by one who knew them both.

Wide divergences are noted in complexion, in physiognomy, in hairiness of the face, in the proportions of the body and limbs, between the Eskimo of different districts. Thus we have a puzzling absence of uniformity in a race which is considered unusually

¹The Hudson Bay Eskimo. Eleventh Ann. Rep. Bur. Amer. Ethnol., 1889-1890, p. 179.

²The Eskimo About Bering Strait. Eighteenth Ann. Rep. Bur. Amer. Ethnol., 1896-1897, pp. 26, 28.

³W. H. Dall: Alaska, pp. 137-140.

⁴A. M. Reeves: The Finding of Wineland the Good. Notes.

⁵Rev. Geo. Patterson: The Beothicks of Newfoundland, p. 146.

homogeneous. Now shall we say that the Skrellings were Eskimo, or not Eskimo, because they were small, or dark, or big-eyed, or ugly-haired, or what you will?

It is equally true that some of the greatest contrasts of the human race are found among Indians. As to stature, the Patagonians and Fuegians, near neighbors, offer an almost classic example. But we do not need to go so far afield. The Caddo of Oklahoma, or near it, are said to be little men; the Osage of the same prairie region have been called giants even by other Indians. The Zuni are usually short; the Nez Percés often tall. At the east it was the same. The Iroquois and some Algonquian tribes towered over their neighbors. Strachey¹ describes the Susquehannock as "a giant-like people," the Wicomico as "of little stature and very rude"; but they both dwelt on rivers emptying into the same generous Chesapeake Bay, and their conditions were identical. The few Micmac whom I have seen appeared under medium height. The Nanticoke do not greatly pass that standard.

As to the other items, compare this description by Verrazano:²

The complexion of these people is black, not much different from that of the Ethiopians. Their hair is black and thick and not very long; it is worn tied back upon the head in the form of a little tail. In person they are of good proportions, of middle stature, a little above our own; broad across the breast, strong in the arms, and well formed in other parts of the body. The only exception to their good looks is that they have broad faces; but not all, for we saw many that had sharp ones, with large black eyes and fixed expression. They are not very strong in body, but acute in mind, active and swift of foot.

Here in close juxtaposition we have the breadth of face, which Brereton³ and Gosnold also observed on Cape Cod; the swarthinness; the large eyes, "middle stature," and such peculiarities of hair as might well displease a Norseman or a Celt; but who will take these early Carolinians for Eskimo? On the other hand, he describes the Narraganset Indians as tall and

of very fair complexion; some of them incline more to a white, others to a tawney color; their faces are sharp; their hair long and black and sharp, their expression mild and pleasant, greatly resembling the antique.

But again he found the Maine Indians "rude and barbarous" and "very different." They "made the most brutal signs of disdain."

Similarly a southwestern Federal judge, lately deceased—a man of strong intellect and keen perception, with no theories to sustain—

¹ W. Strachey: *The Historie of Travaile into Virginia*, p. 41.

² Translation in *Old South Leaflets*.

³ J. Brereton: *A Briefe Relation of the Discoverie of the North Part of Virginia* by Gosnold. *The Bibliographer*, 1902, p. 33. *Old South Leaflets*, vol. 5.

assured me about four years ago that whether Indians be superior or inferior to negroes depends on the particular tribe chosen for comparison. He instanced one as composed of "highly civilized men"; another as very low in the human scale; and they were not of those usually presented by way of typical extremes, Incas and Fuegians for example. Many tribes, gathered from every quarter, had long been within his jurisdiction, and his acquaintance with their individual members had been uncommonly close and extended.

If we turn to trained and eminent ethnologists, we find no stronger advocate of Indian unity than Dr. Brinton, author of *The American Race*; but who can read his summary of the characteristics of South American tribes, for example, without feeling that his witnesses turn against him? Some of these people, it appears, are nearly white, others nearly black, with a cavalier defiance of latitude and isothermal lines in both cases. Here is a bestial-featured tribe, there a noble one; here a tall people, there a horde of dwarfs; and on the borders of humane, ancient, widely extended civilization—or something very near it—a mere *débris* of human derelicts and incapables. Dr. Brinton proves that too much has been made of the homogeneity of the American Indians.

As already suggested, the truth seems to be that American Indians, when first encountered, comprised more than a few survivals of earlier rudimentary peoples often partly assimilated, as well as some intrusive elements, occasionally higher in type and culture and of uncertain origin. Furthermore they had developed heterogeneously in diverse conditions. They still differ among themselves—considering the two American continents together—in many ways. Yet if we were called on to name their most salient and generally characteristic features we should all probably select their cheek-bones, color, hair, and eyes. It is significant that these were noted particularly by the observant Norsemen. That the cheeks are usually prominent rather than broad, the eyes conspicuously keen rather than conspicuously large, and that swarthy is hardly the best word for the peculiar tint of their complexion, are matters of detail, easily variable. Subsequent transmitters would be likely to make a few careless or poetic changes, if the original narrators did not; also the visitors were judged by the standard height of the European North, for these Icelandic observers had perhaps never seen a man who was not of the white race. If the word "short" were used, as in one saga, we have only to suppose that Indians of the Wicomico pattern stood before them; Micmac visitors might call forth the statement. In all this,

there is nothing which confines us to the Eskimo, and little which would fit the Eskimo equally well.

Hawes¹ says of the Saghalien Gilyak: "I was struck with their resemblance to North American Indians, their swarthy features, high cheekbones, raven hair and moccasined legs, the impression being heightened by their paddling a dug-out canoe." Kennan² mentions the "swarthy" faces of the Kamchatkan Koryak; adding "their high cheekbones, bold black eyes and straight coal-black hair suggested an intimate relationship to our own Indians." Thus we have two independent observers of different nations instructively selecting as Indian the same features as the saga and even using its most doubtful adjective.

The general impression left by their conduct is surely the same. Love of bright colors; improvidence in bargaining;³ impulsiveness in curiosity, suspicion, alarm, and vindictive retaliation; readiness to discard a tool which they could not understand; sudden panic, before what must have seemed to them an outburst of insanity—all are surely unsophisticated Indian in psychology, though they might happen to be displayed by Eskimo. The last item is an impressive typical example, for all accounts agree that such visitations are peculiarly daunting to the red-man, being looked upon as divine or diabolical possession, in the ancient way. From Cooper down they have been a stock expedient of Indian romance-writers. His "Deerslayer" presents vividly the consideration accorded by the Iroquois—most merciless of all fierce peoples—to even a mild form of dementia.

On their part the Icelanders behaved better than many later colonists; dealing fairly, after their light, though getting the better side of the bargain with these simple folk, and not using their weapons except in defense, until after they had lost one of their best men by a wanton attack, as it would seem to them, and had been forced to abandon their pleasant homes and their hopeful venture. Karlsefni's quick-tempered bull was the chief culprit, bringing trouble and loss to all human beings concerned. He stands out as one of the few quadrupeds which have meddled with history.

From this episode, common to all these Wineland sagas, it has been inferred, not quite convincingly, that these natives had never seen a bison. Hence Laing (preface to *Heimskringla*) believes they

¹ C. H. Hawes: *In the Uttermost East*, p. 135.

² G. Kennan: *Tent Life in Siberia*, p. 171.

³ W. H. Dall: *Tribes of the Extreme Northwest*, p. 238. ("A piece of coarse cloth for a dressed deerskin".)

could hardly be mainland Indians. Fiske replies: "Bisons on the Atlantic coast, Mr. Laing?" Now they *were* found near the sites of Washington and Richmond in the early seventeenth century,¹ hunted in the marshes of Georgia long afterward, and not wholly extirpated from the Appalachian mountains until 1800 or later; so that stragglers of their advance guard almost certainly reached salt water. But so far as concerns New England, Dr. Fiske's note of exclamation may well be right, although the Orkneyman's position is not really absurd. A straggling bison² was killed about 1790 or 1800 near Lewisburg on the Susquehanna, and there are indications of their former presence about as far east at other points. They were plentiful in parts of the Pennsylvania mountains, yet it is unlikely that they ever crossed the Hudson.

Moreover, the bison herds came late into the Appalachian region, and left early. Shaler's³ excavations near a Kentucky saltlick showed, lowest, a considerable depth of mammoth bones; then, those of a muskox when the glacier front was but little way northward; finally, the bison, with every appearance of recentness. Few of their remains are found in even the later mounds of the Mississippi drainage. From all indications and with the aid of the best ethnologists, Shaler inferred that the culture of these agricultural people and builders of the great defensive earthworks was in full flower about the year 1000 (Leif's date) and that the bison at that time had not crossed the Mississippi, coming eastward, but were all probably still near the Rocky Mountains. He suspects them of tempting the mound builders afterward out of their incipient civilization and into burning the woods to make buffalo pastures. But the menace of these wild herds to the hundred acre cornfields, also the attacks of hordes of savages traveling with or after them, would perhaps have still more to do with the final breaking up.

How far an acquaintance with bison would prepare the Hóp natives to receive with equanimity the charge of the settlers' bull is a metaphysical question I can not answer. Perhaps they supposed his challenge to be incited by their entertainers, especially if the Norsemen laughed at them, as we may guess they unwisely did. Thus viewed, Indians might see insult, treachery, and deadly danger

¹ W. T. Hornaday: The Extermination of the American Bison. Ann. Rep. U. S. Nat. Mus., 1887.

² Allen: History of the American Bison. U. S. Geol. and Geogr. Survey of Colorado (1875), p. 443.

³ Nature and Man in America, pp. 181-186.

in it. One cannot be sure that the memory of any wild animal would soothe them adequately.

But they seem to have offered no buffalo robe for sale, such as the scouts of De Soto bought in the Carolina mountains, and in view of the limitations of period and range above stated, we are no doubt safe in acquitting the Hóp Skrellings of any acquaintance with any kind of cattle; and moose would not help the case at all.

Indians in general had few metals; but gold ornaments were scattered through the south as far as the outer Bahamas, where Columbus found them, and copper in like manner through the north-east, being shown to Gosnold¹ on Cape Cod in 1620, besides some earlier entries. The few survivors of the Roanoke massacre, according to Powhatan (see Strachey), were employed as slaves in beating it out for a chief. Some of it may have been mined in the mountains, but the chief source of supply regularly worked seems to have been the shores of the upper lakes, as the chief source of gold supply was probably central Mexico. But the transfer of such articles or materials, whether by barter or through migration, must depend on intervening peoples, and the conditions of one century are not necessarily those of another even among uncivilized men.

The earthwork builders of Ohio might, if they chose, absorb and hold most of the southeastern flow of copper until they were driven from their strongholds; whether they were Sioux, Cherokee, Mandan, Appalachian, or of the remoter southwest; whether a temporary league of the Algonquians and the Iroquois overcame them, or they fell under the attack of hunting Dakota; and whether they went westward beyond the Mississippi, or into the mountains as Cherokee, or were scattered among many tribes—all debatable hypotheses which have been advanced, but need not be rediscussed here; and we do not know when the working began of the meager supplies afterward obtained, as we are told, in Virginia and New Jersey. In this view of the case, copper would not probably reach New England from any quarter by Thorfinn's time. Whatever the reason, the seaboard tribes about Hóp do not then seem to have possessed it. But this does not at all imply any lack of such adornments at that place a few centuries later.

As already noticed, these people apparently wore no garments worth mentioning, very likely only Nauset grass aprons or a diminutive form of breech-clout. They can not then have been Eskimo.

¹ Brereton's *Briefe Relation*, before cited. *Old South Leaflets*; and *The Bibliographer*, 1902, p. 33.

They did not make any visits in the winter, when the Eskimo prefer to journey. They had no sleds, no dogs, no harness, though these promptly attracted Frobisher's¹ attention in Labrador, and Davis tells of fighting off the Greenland dogs which the Eskimo set on him. Nansen² even lays stress on the use of this method of land transportation, as making against the theory of the development of these Innuits from the Indians; adding, "In this the Eskimo more resembles the races of the Asiatic polar regions." It is true that dogs were not uncommon in many Indian villages as pets or sacrifices, or to aid in hunting or serve for food. But these people came to Hóp always by water, apparently from some rather distant point southward, and on such excursions the dogs would most likely be left behind. Besides lack of room in the boats, they might interfere with the plans of a war party or even disturb trading. Moreover, early travelers often do not mention them, and presumably they were rare in some tribes. The Indians had no such imperative need for them as the Eskimo, and might be much later in acquiring them along the Atlantic coast. We have no real reason to suppose their presence among the New England Algonquians in the year 1000, but it would be a marvel if they were not then drawing the Eskimo of Labrador, and indeed of all quarters, over the snow.

There is no hint, either, in the saga of the faithful and spirited bone-carving and other sculpture and artistry, which made Prof. Boyd Dawkins in Cave Hunting conjecturally identify the Innuits with the paleolithic European cave-dwellers. Both had the seeing eye and the cunning hand, also a sense of the picturesque, along with patient industry in embodiment. Our northeastern Indian picture makers were infantile and freakish in comparison. The Norsemen would neither have heeded nor mentioned such "Skrelling" efforts.

It may be repeated as important that we hear of no kayak, nor of any of the accouterments which ordinarily pertained to the kayaker. Why should Thorfinn be less impressed by this unique Eskimo craft than were Antonio Zeno, Baffin,³ and Lescarbot? We have seen reason to suppose that one Eskimo and his kayak quite appalled Thorfinn's party in the Gulf of St. Lawrence. Surely the reappearance of the phenomenon, multiplied, would not have been disregarded—whether in confirmation or explanation. By "boats" we must

¹ Hakluyt's *Principal Voyages* (1904), vol. 7, pp. 225, 413.

² Fr. Nansen: *Eskimo Life*, p. 8.

³ C. R. Markham: *Voyages of Baffin*, p. 14. (Catonle's Relation). See also Olaus Magnus: *A Compendious History*, p. 20 (transl. pub. by Streater); as to Greenland boats "not so much above, as beneath the surface."

naturally understand open boats, which were all that they had ever seen—except in ill-understood fragments on the Greenland shore. It is not merely, however, that kayaks would be decked over; they are more of a garment or personal appendage than a mere vehicle for water transit. "As a rule each hunter makes his kayak for himself, and it is fitted to the man's size just like a garment,"¹ the central "kayak-ring" being a boat-combing and a man's water-tight belt in one. The world does not present anything else quite like this Eskimo invention, and few of that race on open waters are without it.

If we consider the Skrellings ("weaklings") of Hóp to be Indians, the above items offer no difficulty. They went naked or nearly so, because the weather was mild, as at Nauset, except in the depth of winter. They did not use a harpoon and float, nor carve spirited animal figures in bone, because the former did not belong to the customs nor the latter to the tendencies and capabilities of their race. Probably they had never seen anything so Arctic and un-Indian as a dog-sled or a kayak. But what can be said for an old-time Eskimo in Labrador without any of these things? Yet Professor Fernald, for example, seems to think that the Hóp Skrellings were Eskimo and that Wineland was in Labrador.

The brandishing of staves (paddles?) in the direction of the sun's course to show amity, or reversely by way of defiance, cannot be called indicative of either people. Norse folklore would predispose the observers to illusion on such points—witness the direful Moon² of Wierd which traveled in the latter fashion about the hall of Frodis-water before the eyes of living men and women doomed to ghostly hauntings or to death. The normal circuit would bear the contrary and conciliatory meaning. Of course Thorfinn and Snorri interpreted these movements by the facial expression, the tones, and other indications of the mood of the approaching men. Finding themselves understood, the latter would emphasize and repeat the gesture, even if it were at first accidental, or would naturally reverse it to convey a contrary message. But after all the signs may also have been customary with them exactly as seen, for these might suggest themselves by the contrast of natural and unnatural in any mind. They tell us nothing.

The native boats came three times, with dramatically presented climax. First "nine skin canoes" drawn by mere curiosity; secondly,

¹ Fr. Nansen: *Eskimo Life*, p. 46.

² *Eyrbyggja Saga*. Morris's and Magnusson's translation.

"a great number of skin canoes rowing from the south past the cape, so numerous that it looked as if coals had been scattered broadcast out before the bay," for they had come to trade and to feel safe in trading; thirdly, "a great multitude of Skrelling boats approaching from the south as if a stream were pouring down."

There may be no significance in the substitution of Skrelling for "skin" in the third mention. As they mistook paddling for rowing—unless the saga-man, centuries after the occurrence, changed the words—perhaps we ought not to be very certain about such a detail. They had seen at least fragments of skin-covered boats in Greenland, as we know from Ari and Thorkel Gellison,¹ and may have been predisposed to assume identity of covering in two articles not unlike at a distance, or even very near, as Dr. Storm has suggested. A dark-tinted birch-bark-covered canoe, such as I have seen on the shore of Lake Superior, might well be taken for one covered with equally dark and smooth porpoise hide or cured sealskin or the prepared and hairless skin of any marine animal, especially by a man who expected the latter and was uncritical in distinguishing. Moreover the saga-man would remember the hide-covered boats of Ireland and other European countries, but would never think of tree-bark as a probable covering material. He might even suppose that he was making a strictly necessary correction by such a change. Indeed both coverings are really skins, animal or vegetable. The name "woodskin" is still commonly applied to the bullet-tree bark boats in use on the Essequibo River. Mr. Kirke's *Twenty-five Years in British Guiana*² presents a neat parallel (by reversal) to an error of observation such as Dr. Storm suggests in this case. It appears that a "woodskin," being suddenly lifted from the water, was taken for an alligator or some other animal, hide and all, creating a brief panic, which even the Indian boatman shared. So, vegetable skin has been and may be mistaken for animal; then why not animal for vegetable?—and what is there in the bark of the "black birch," more than in that of the rubber tree, to secure immunity from mistake? It may be that many people, considering the matter, have the pretty delicate bark of the white paper birch in mind; but that would not answer. Indeed, no bark is so good as some woven fabrics, and the Passamaquoddy at least have now generally accepted the latter as canoe-covering; for the Indian is not so hopelessly unadaptable as he is painted.

¹ G. Storm: *Studies on the Vineland Voyages*.

² Page 466.

But if these were skin-boats in the animal sense, what then? The Eskimo use such undoubtedly, excepting the most northerly group, Rasmussen's People of the Polar North. Practically it has been the only covering material available, as well as the one best fitting the conditions of Arctic life. They have two kinds, the larger open umiak and the smaller kayak,¹ the latter being closed on top quite to the wearer's body, so that an expert kayaker can turn somersault in the water. One can hardly believe that any such multitude of the great umiaks could have been gathered as the saga calls for; or that the Norsemen would fail to note instantly such an anomaly as a little boat hugging the occupant's body. It is not to be doubted, either, that the ancient conservative Eskimo had the kayak in Thorfinn's time.

But some say that Indians never used skin-boats. It appears that they did when there was a reason. The Dakota² women crossed prairie rivers in coracles, or "bull-boats" of buffalo-hide; the Omaha³ also made skin-covered boats and used them; the same assertion is made of the Nascopie,⁴ and Dr. Brinton⁵ presents a more strictly relevant instance in the statement that the Beothuk of Newfoundland had both "bark-canoes and skin-canoes." They were not confined to inland navigation, either, till the last. Whitbourne (1622) says: "Which canoes are the boats that they used to go to sea in," and the Rev. George Patterson,⁶ who quotes him, remarks: "Their seamanship was evinced by their visiting Funk Island 40 miles from the nearest point of land"—a trip which they seem to have made twice a year after eggs and young birds. Cartwright⁷ also lays stress on this seafaring skill. Unless Dr. Brinton be in error, we have only to suppose a sufficient southward extension of the Beothuk at the opening of the eleventh century, and nothing remains of the skin-boat argument in favor of the Eskimo. Nor were these Beothuk half-way between the races, as Lieutenant Holm, by analogy with the Aleut, seems to fancy; for their appliances, works, ways, and language, so far as yet rescued by ethnologists, reveal a surprising individuality, distinctly of the Indian type, though a few things may have been

¹ W. H. Dall: *Alaska and its resources*, p. 138.

² W J McGee: *The Siouan Indians*. Fifteenth Ann. Rep. Bur. Amer. Ethnol., p. 172.

³ F. S. Dellenbaugh: *The North Americans of Yesterday*, p. 284.

⁴ R. C. Haliburton: *A Search for Lost Colonies*. Pop. Sci. Mo., vol. 27, p. 42.

⁵ Brinton: *The American Race*, pp. 40, 67.

⁶ Rev. Geo. Patterson: *The Beothiks or Red Indians of Newfoundland*, p. 126.

⁷ Journal republished 1911.

borrowed from their northern neighbors. But we are not at all confined to this Beothuk hypothesis.

The question is mainly one of convenience as to material. The Indian takes what is best adapted to his purpose within the limits of what he can get. In Venezuela and the St. Lawrence basin and near one tributary of the Amazon¹ he used bark (of the bullet tree, the elm tree, the black birch and perhaps others); in Newfoundland he sometimes used "animal hides"; at the mouth of the Bay of Fundy he now most often uses water-proof fabric; but for temperate America generally the old-time typical canoe was the "dug-out," hollowed and shaped from a tree-trunk and heavy but durable. Something lighter was needed for the northern portages in the region torn by the glaciers, and there only the canoe-birch offered itself, with the elm as a poor substitute when the former was not plentiful; also, going northward, the size of tree trunks lessened until at last a canoe could not be hollowed and carved but must be put together as a frame and covering.

The word "canoe" on the Chesapeake still means primarily a vessel made from one or more tree-trunks. They are often large, often swift and graceful under sail, besides being the most unsinkable craft afloat; and "canoe-regattas" in this sense have been held annually off Talbot County for many years.

This was almost as exclusively the case in southern New England, where canoe-birch trees of good size were rare, if existent, and there was little or no need for portages. Verrazano was visited at Narragansett Bay by Indians in dugouts only, and describes them; Champlain tells us just how they were manufactured farther north. Thus far, following the general trend of these arguments, I have compared one kind of frame-boat with another, but it is most likely that the boats which were paddled into Hóp had no need of any frame or any covering, although their dark and water-polished sides might resemble smooth bark or smooth hide. Their material of course would be really more akin to the fireplace brands or dark wooden "coals," with which in the distance they are compared by the saga. But in truth our Norsemen would trouble themselves little about the details of such matters. The furs for sale and the unusual weapons were far more interesting.

Naturally, emphasis has been laid on the latter; which were near bringing destruction on the colony, and which surprise us yet.

Slings have long been considered by many a non-Indian weapon;

¹ A. R. Wallace: *Narrative of Travels on the Amazon*, p. 358.

and they were used by Eskimo near Godthaab in 1586. Davis¹ narrates: "They with slings threw stones very fiercely into the moonlight and strake one of the men, then boatswain, that he overthrew." Thorbrand may have been overthrown more fatally by one at Hóp, for a "flat stone" killed him. This, of course, might be a tomahawk; but, the "war-slings" are distinctly mentioned by the saga, leaving no room for doubt. Thus far the eleventh century Skrellings and sixteenth century Eskimo agree very well.

But it appears that some of the northeastern Indians of the late fifteenth century were slingers too. The map attributed to Sebastian Cabot and now in the National Library at Paris is provided with notes in Spanish and Latin, which HARRISSE² attributes to Grajales, an early Spanish editor. Note 8 is in both languages, and includes a list of weapons used by the inhabitants of the Isle of St. John. HARRISSE's English translation is: "This land was discovered by John Cabot a Venetian and Sebastian his son the year of the redemption of the world 1494 on the 24th of July at the fifth hour of daybreak, which land they called the first land seen and a large island opposite the same St. John, because it was discovered on the solemn festival of St. John. The inhabitants³ of that country are dressed in the skins of animals. They use in war bows, arrows, darts, lances, wooden clubs and *slings*." Note 17 declares that the map was delineated in 1544.

Hakluyt appears to have known of an extract from a map which was "hung up in the privy gallery at Whitehall." His copy in Latin repeats the words *sagittis, hastis spiculis, clavis ligneris et fundis*.

A German work in Latin, brought to light by Dr. Major, copies nineteen inscriptions from a map which the author had seen in Oxford in 1556, containing the same entry. Its seventeenth note avers that "Sebastian Cabot, Captain and Pilot, of his Sacred, etc., Majesty put upon me the finishing hand in a plane figure in the year 1549." The map at Paris⁴ was obtained from a Bavarian clergyman, and its earlier history seems unknown. But it seems reasonably well established that a map was made about the middle of the sixteenth century by or under the direction of Sebastian Cabot which attributed slings to the Indians of St. John Island on the American coast in

¹ Hakluyt's *Principal Voyages*, vol. 7, p. 400. Also Markham's *Voyages*, and *Works of John Davis*.

² *Trans. Royal Soc. Canada*, 1898, p. 105.

³ Quoted also in Packard: *The Coast of Labrador*, and in several other works before cited.

⁴ G. E. Weare: *Cabot's Discovery of North America*, vol. 1, p. 261.

1497. His testimony has incurred some doubt where matters pertaining to his own achievements are concerned, but in this instance there would be but little temptation to misrepresent.

Many have supposed the Isle of St. John of the Cabots to be Newfoundland itself; but that they should have recognized, from merely skirting the seaboard, the insular character of this great mass of land is in the highest degree unlikely, in view of Cartier's¹ uncertainty even after he had passed into the Gulf through the Strait of Belle Isle, which Cortereal² missed altogether. Cape Breton, Prince Edward Island, and Sable Island have each borne this name on maps or in speech at various times, but there are reasons against them all. Most likely Avalon Peninsula,³ shown as an island by some of the older maps, was Cabot's Isle of St. John. Its slingers would have been Beothuk, then, or perhaps invading Micmac—whom Fiske may have had in mind when stating in *The Discovery of America* that slings would be as proper to Micmac as to Eskimo.

At the present time slings⁴ are not found in use at any nearer point than the Pueblos of the upper Rio Grande; but they hold their ground very well in many parts of South America, always, with Mexico and intervening regions—the main home and headquarters of their race.⁵ Sling-using begins at the bottom of the map, with the almost Antarctic and altogether wretched Yahgans of Tierra del Fuego; and Bandelier has lately found it as active as ever in the village fights beside Lake Titicaca, the cradle of the most humane culture and the widest and best ordered governmental organization in the New World before the white man came. He writes:⁶ "A number are badly wounded now and then and some of them are killed, for the Indian is a dangerous expert with the sling." Again we read of "his sling, for which the women provide round pebbles in their skirts."

At the opening of the sixteenth century, the sling-territory extended very much farther northward. Maya cities employed this weapon. Aztec armies had their slingers no less than those of the Incas. Dr. Friederici,⁷ gleaned from early Spanish, French, and English narra-

¹ J. Winsor: *From Cartier to Frontenac*. Narr. Crit. Hist. Amer.

² W. S. Wallace's *Historical Introduction to Labrador*, by W. T. Grenfell and others.

³ M. F. Howley: *The Ecclesiastical History of Newfoundland*, p. 53.

⁴ Where they are chiefly in use by children, as Mr. Spinden of the Am. Museum relates.

⁵ Brinton: *The American Race*, p. 331.

⁶ A. F. Bandelier: *The Islands of Titicaca and Koati*, pp. 88, 115.

⁷ A. Petermann's *Geographische Mittheilungen*, 1911, Heft 2 (pl. 13).

tives, offers us a map based on the use of slings and blowguns in which the former are given an immense area of the Rocky Mountain country and the Pacific coast; also extended in a very narrow fringe along the shores of the Gulf of Mexico and the Atlantic as far as Hudson River. Even allowing for some misreports and misunderstandings, we cannot fail to see a progressive yielding of territory through the centuries. Apparently the sling¹ is an archaic American weapon, once of general prevalence, which has gradually given way to the bow and vanished before the rifle, holding out best in isolated nooks, or for special uses, or where favored by natural conditions. That it was not found by Miles Standish at Plymouth and Narragansett by no means makes its presence there improbable six hundred years earlier.

The great noisy body which was cast on the ground behind the Norsemen is something quite unique in historic Indian warfare. Higginson² suggested that it might be a harpoon with a bladder float. Schoolcraft³ more plausibly identified it with a traditional but long obsolete form of giant club wielded by several men and said to have been in use during the severe wars of the Ojibwa, fiercest and most powerful of Algonquian tribes, as they moved westward to the upper lakes. It was prepared by shrinking a deer's hide around a large and heavy stone and on the end of a pole, to which it was bound. Of course the crashing effect would be great. But it does not fully correspond to the Skrellings' monstrous and unheard of creation.

The Skrellings raised up on poles a great ball-shaped body, almost the size of a sheep's belly and nearly black in color, and this they hurled from the poles upon the land above Karlsefni's followers and it made a frightful noise where it fell. Whereat a great fear fell upon Karlsefni and all his men, for it seemed to them that the troop of the Skrellings was rushing toward them from every side.

The nearest analogue would be a hand-grenade; but Thorfinn could not know of such a thing. Before the arrival of the next white men, it was utterly forgotten. Whether truly reported in the saga or not, it stands an unsolved mystery, having a very ancient look.

Dr. Fiske accepted Schoolcraft's Ojibwa explanation as conclusive. Nevertheless, Mr. James Mooney, who has spent much time among divers Indian tribes, tells me that he cannot make it agree

¹For instances of former use in what is now Spanish-America consult Herbert Spencer's *Descriptive Sociology*, part 2, the works of Brinton, Markham, H. H. Bancroft, and others already cited.

²T. W. Higginson and W. MacDonald: *History of the United States*. Edition 1905, p. 39.

³H. R. Schoolcraft: *American Indians*, vol. 1, p. 73.

with what he knows of Indian fighting. Besides, though a four-man club, for all its clumsiness, might cause alarm and do damage, it could hardly strike on the ground beyond the enemy, making such an uproar as to suggest an attack from the rear by another "troop" descending on them "from the land" to cut off their retreat.

Here was the situation: Karlsefni's men drawn up before the first houses near the bay shore, with the river on their right, the ground sloping up behind them to the woods, and assailed in front by a multitude of enemies who sprang from their canoes as these touched the land. Almost certainly some of them would turn the position by ascending the river, awakening disquiet. Amid a shower of sling-stones, arrows, and tomahawks, which the Icelanders were too few to adequately answer, there is a rush of a group of Indians carrying great poles, with something huge, black, and uncanny poised above them, and this is cast, amid such a pandemonium of sound as wild Indians best can raise, over the heads of the defenders, beyond them on the ground, where there is a tremendous additional uproar, reinforced by the echoes from the wood border. At once the Norsemen feel, hear (and so see) enemies, on every side; panic takes them and they rush for a more defensible position, the women streaming out of the string of cabins to join the race, and Thorbrand, son of Snorri, Karlsefni's friend, being stricken down just ahead of Freydis within the wood-border by one of the missiles that come showering after them. She snatches his sword and turns, wild with fear and defiant anger, just as the Norsemen, rallying, turn also on the wooded Fall River Bluffs behind her, and come back ashamed of their fear. Then the Indians, not always good at pressing home a victory won, (or they might have annihilated Braddock's force notwithstanding the rear-guard stand of the colonial rangers), yield in their turn and paddle away.

This is all consistent and most probable, granting the original panic, but something more than "a giant club" is required to explain it. Thus far a satisfactory explanation is not forthcoming. Possibly the solid "demon's head" suggested a hollow one, capable of being detachable from its support and cast by several poles together a good way up the hillside. If not some such clever invention of the moment, it must be a Norse reminiscence incorporated by the saga-man, as Dr. Nansen¹ has acutely suggested.

¹ Fr. Nansen: In Northern Mists, vol. 2, p. 8.

17.—REVIEW OF DR. NANSEN'S CONCLUSIONS

The more significant of Dr. Nansen's¹ observations in regard to the Norsemen in America have been briefly considered in relevant parts of the foregoing chapters. He has certainly added some valuable items of fact and gathered a most welcome array of ancient and medieval description, folk-lore, and mythology concerning delightful islands, real or fancied, such as the fourteenth, fifteenth, sixteenth and seventeenth century maps show to us plentifully and the beliefs concerning which have long been known in a general way to readers interested in such topics. Perhaps he has not sufficiently set forth the great contrast between the florid and preposterous extravagances of the Celtic sea stories and the sanity of the exploring part of Thorfinn Karlsefni's story, and of all that concerns him, indeed, Leif's story also, wherein can be found only a bare hint of the occult, such as people even of our own time never quite wholly and conclusively disbelieve. He may have made it even more nearly certain if possible than before that the Celtic and Scandinavian sea tales, meeting in Ireland and Iceland, had a moderate reciprocal influence; but if the Icelanders were indebted mainly to Ireland for the name and story of Wineland, it seems entirely probable that their borrowing would have included in great measure the distinctive extravagances of Bran, Maelduin, St. Brandan, and their kind. It almost passes the bounds of possibility that the saga-man who wove the spectral marvels and picturesque magic of his own people into the Greenland part of his narrative should have ignored all the prodigies and impressive insular unrealities of the Irish writings and traditions if really familiar with them and drawing from that source in the exploring part of his story—and have confined himself almost entirely to matter-of-fact items, which fit with such astonishing accuracy the probable American shoreline of his time and the absolute certainties of American vegetable and animal life. The voyage record seems to be an accurate report, detailed though brief, as sensible and as credible in all essentials as any modern official document.

Dr. Nansen asserts that the Norsemen "steered straight across the Atlantic itself and discovered North America";² that the "open craft of the Norwegian Vikings, with their square sails, fared north and west over the whole ocean, from Novaya Zemlya and Spitsbergen to Greenland, Baffin's Bay, Newfoundland and North America";³

¹ Fridtjof Nansen: *In Northern Mists. Arctic Exploration in Early Times*; translated by Arthur G. Chater; New York, 1911, vol. 2, pp. 58-62.

² *Ibid.*, p. 234.

³ *Ibid.*, p. 248.

also that they visited Cape Breton (Keelness), the Wonderstrands below it, and some point yet farther down the coast where they met Indians and not Eskimo. He accepts their Helluland as probably Labrador, Markland as Newfoundland, and, as above, the discovery of the region called Wineland in the saga, though questioning the name or its implication.

He lays even an excessive stress, it seems to me, on the entry in Icelandic annals, one at least being nearly contemporary, of the Greenland ship driven by stress of weather to Iceland in 1347, her crew reporting an intervening visit to Markland. But, after all, how can he be sure that these seamen told the truth? Why are they more trustworthy than Gudleif, whose visit to Biorn in some land of the west has been mentioned already, except that he gives us tests of accuracy which fail, and their meager story supplies no tests? Moreover, are we quite sure of the accuracy of the first annalist and possible intervening narrators? The statement is a bare sentence or two in length, credible enough in view of what we know from the saga and valuable as cumulative corroboration. But it will not do for the historic cornerstone of any evidence; nor does it make Markland a whit more historic than Helluland or Wineland. The main features of the exploring part of the saga tale are connected in a chain and of the same degree of reliability. They must stand or fall together.

If the name Wineland be objectionable, we might give up the poetry of it without disaster. As above indicated, Dr. Nansen seems to agree exactly and fully with our version of the itinerary of these early explorers, at least as far as the Atlantic coast below Cape Breton island and their temporary settlement in a more southerly Indian-populated region, called Hóp, in the saga. Beyond that he summarizes his conclusions under the following twenty-two points which it seems proper here to consider in succession, with some comments from my own observations. Dr. Nansen says:¹

If we now look back upon all the problems it has been sought to solve in this chapter, the impression may be a somewhat heterogeneous and negative one; the majority will doubtless be struck at the outset by the multiplicity of the paths, and by the intercrossing due to this multiplicity. But if we force our way through the network of by-paths and follow up the essential leading lines, it appears to me that there is established a firm and powerful series of conclusions, which it will not be easy to shake. The most important steps in this series are:

(1) The oldest authority,² Adam of Bremen's work, in which Wineland is mentioned, is untrustworthy, and with the exception of the name and of the

¹ In *Northern Mists*, vol. 2, pp. 58 *et seq.*

² The Ringerike runic stone is not given here, as its mention of Wineland is uncertain.

fable of wine being produced there, contains nothing beyond what is found in Isidore.

Adam of Bremen wrote true things as well as marvels, just as many writers from his time and long afterward have done. He may be trusted within reason, as well as those. He is careful to insist that this statement in regard to the wheat and wine is no marvel, but literal truth. What he wrote would be true of the American coast and would be especially true of its distinctive conspicuous food supplies in the latitudes we have pointed out, before the coming of maize. The wine-making fine large grapes have Strachey's corroboration, also Lescarbot's. They are here still. They make strongly for verisimilitude and to the saga's credit.

(2) The oldest Icelandic authorities that mention the name of "Vinland," or in the "Landnáma," "Vindland hit Góða," say nothing about its discovery or about the wine there; on the other hand, Ari Frode mentions the "Skrælings" (who must originally have been regarded as a fairy people). The name of Leif Ericson is mentioned, unconnected with Wineland or its discovery.

Full statements could not be expected in each relic of an ancient fragmentary literature. Ari's lost *Islendingabók* probably set forth the full account. Entries a little later present the above items together. Mere evidence by omission is rarely cogent. It cannot reasonably override the positive evidence referred to and the general prevailing tradition. If it could, it would merely change the name of the discoverer, for it is admitted that some one sailed from Norway and found America by the direct passage. If not Leif, who shall be named? And is there more evidence that an anonymous Norseman did it rather than that Leif did it?

(3) It is not till well on in the thirteenth century that Leif's surname of Heppni, his discovery of Wineland ("Vinland" or "Vindland"), and his Christianizing of Greenland are mentioned (in the "Kristni-saga" and "Heimskringla"), but still there is nothing about wine.

This fact may be unfortunate, but what does it disprove? His father Eric was never called "Lucky" so far as we know, yet he created Norse Greenland. It does not seem important that a man's epithet should always be found with his name in the few surviving pre-thirteenth-century manuscripts.

(4) It is not till the close of the thirteenth century that any information occurs as to what and where Wineland was, with statements as to the wine and wheat there, and a description of voyages thither (in the *Saga of Eric the Red*). But still the accounts omit to inform us who gave the name and why.

In other words, the location of Wineland was not mentioned so far as we know, till Hauk Erlendsson made the earliest copy of the

saga and of Landnamabók that happens to survive. In merely Icelandic records and stories we have no right to expect such information unless from Islendingabók, which is lost. The situation is a natural one. If Hauksbook had happened to be destroyed the date must have been carried along further still, and that would yet prove nothing, except that our evidence would be less in volume and force.

(5) The second and later principal narrative of voyages to Wineland (the Flateyjarbook's "Grœnlendinga-pátttr") gives a very different account of the discovery, by another, and likewise of the later voyages thither.

That is true. The natural course of development is for a later version to elaborate hints and weave stories about names, filling in any floating legendary data which may come to hand. This is especially true in a decadent artificial period, even at its beginning. The Flateyjarbook narrative is not unique in its method and qualities, but is a very bad example.

(6) The first of the two sagas, and the one which is regarded as more to be relied on, contains scarcely a single feature that is not wholly or in part mythical or borrowed from elsewhere; both sagas have an air of romance.

This is far from the case, for Helluland, Markland, Kiallarness, are all admitted by Nansen to exist. Straumey, Straumfiord, the mountains, Hóp, the seal headland are veritable. The courses around the great ness into and out of the Gulf are accurately and carefully given. Biarney is true to fact. The Wonderstrands are the typical American coast line found on no other Atlantic shore of which any Icelander short of the fifteenth century would be likely even to hear. The Indians, products, climate, and breeding places are authentic. The Uniped was probably an Eskimo in his kayak. The Greenland part of the tale has many embroideries of fancy. There are divers ballads turned to prose attached to the exploring narrative; but they do not invalidate or obscure it. The saga-man might have chosen *ad libitum* magical cats and dog-footed monsters, the roc-phoenix and the island of unending laughter, holy white-furred hermits and angels who waited on the table, Judas and his hounding devils, the sea-monster that took the saint a-traveling on its back, the isle of women, the pool of youth, and the river of death. His Celtic sources (as supposed) would have done this. Why did he stick to the facts instead? Surely because he was not following Celtic models, but relating facts.

(7) Even among the Greeks of antiquity we find myths of fortunate isles far in the western ocean, with the two characteristic features of Wineland, the wine and the wheat.

It is true that men learned very early of lovely Mediterranean islands and drew on their memory of reality to picture others, sometimes real, sometimes unreal. Myths attached themselves to both. Afterward the Canaries supplied material in the same way. Sometimes they were called isles of the blest or earthly paradises, with good reason and decorated by the exaggeration of poetry and legend with supernal additional delights; sometimes their lovely characteristics were transferred by sailors' fancy to islands farther out at sea. Some of the latter were real; we know them as the Azores and Madeira; the fourteenth century map-makers knew them undoubtedly as The Fortunate Isles of St. Brandan. Their obvious attributes corroborated the ideal. We are not justified in saying conclusively that this was or was not the end of the process. But if anyone crossed the Atlantic in warm latitudes, as Cabral did by accident and Columbus by intention, they would find like beauties repeated. Before "mythical islands" can justly be used to disprove anything we must be sure they were mythical. Even then it would not be necessary to assume that men, in reporting things that really are, had borrowed from fanciful stories.

(8) The most significant features in the description of these Fortunate Isles, or Isles of the Blest, in late classical times and in Isidore are the self-grown or wild-growing vine (on the heights) and the wild-growing (uncultivated, self-sown or unsown) corn or wheat or even cornfields (Isidore). In addition there were lofty trees (Pliny) and mild winters. Thus a complete correspondence with the saga's description of Wineland.

Great trees are common in many parts of the world, so are mild winters in southerly regions on the same longitudinal line. But Isidore says nothing to strongly suggest wild growing grain seen in low places by men entering an estuary with grape-vines on the hills above it. Neither does Pliny nor any other authority cited. The combination is distinctly American on the Atlantic slope not far from the sea and within the limits of the large fox grape though no doubt it might occur elsewhere. Thorfinn gives this for Hóp.

Nansen, however, has certainly shown (if *messis* be taken to necessarily mean grain) a fair anticipation of Adam's celebrated statement, but the coincidence may well grow out of parallel facts. There is no real evidence of derivation by him from Isidore of Seville or from Pliny; but there may well have been grape-festooned islands of the eastern Atlantic on which some form of wild grain or grain run wild might be found. It is not pretended that fox-grapes and our wild rice are the only wild grapes fit for wine and the only self-sown grain in the world.

(9) The various attempts that have been made to bring the natural conditions of the North American coast into agreement with the saga's description of Wineland are more or less artificial, and no natural explanation has been offered of how the two ideas of wine and wheat, both foreign to the Northerners, could have become the distinguishing marks of the country.

The coast line has changed in nine hundred years by the lifting of the northern part, which probably included Straumey and all above it and by the depression of the lower part, which probably included Hóp and all below. I believe I am the first one to call attention to this change in the coast line in connection with the present subject.¹ There has also been error in confusing the little squirrel grapes with the large fox grapes, which were probably not plentiful along the shore above southern Maine and only locally there. We find also a like error as to wild rice, which ought not to be expected in any quantity on or near bold shores like those along the Atlantic above the Kennebec.

It may be that Norsemen could not raise wheat or make wine at home, but they were acquainted with both from their service in more southern countries and their hostile expeditions, even as early as the fifth century (see Nansen's *In Northern Mists*), into the middle of the Mediterranean. Some of their men would be sure to have a general knowledge of wine-making. The very fact that these things were not to be had at home, but grew wild in the new world would make them prized and held as characteristic of the new found lands. That the "wheat" was not real wheat, but only a wholesome and abundant substitute, would make no difference; though the wine would take first place. The country where such things were to be had for the gathering could be nothing but "Wineland the Good," with no need for aid from fairy attributes, though the peculiar form of the name perhaps might be influenced by the Fortunate Islands, namely the Canaries or Madeira (d'Legname—that is, Markland), Porto Santo and perhaps Pico and companions, with their undeniable beauty and the half classical half northern-pagan myths, which persistently clung to them.

(10) In Ireland long before the eleventh century there were many myths and legends of happy lands far out in the ocean to the west; and in the description of these wine and the vine form conspicuous features.

As a matter of fact the vine is not very conspicuous in Irish voyage legend. Still Irishmen often reached countries which had the vine

¹ See Chapter 16 herein, also article in the *Smithsonian Report* for 1897 on the Rising of Land Around Hudson Bay, by Robert Bell, of the Geological Survey of Canada.

and there must have been divers European and perhaps Atlantic spots where good grapes yet grew wild. If they reached America, as they probably did, they would find such in abundance. But Irish fancy working on cultivated grapes might add the element of wildness, even without any information as to the latter in either hemisphere.

(11) From the eleventh century onward, in Ireland and in the North, we meet with a Grape-island or a Wineland, which it seems most reasonable to suppose the same.

We also meet apple islands, for example, the Hesperides? From memory, I think the latter fruit more common in Irish and other northern legend. Nevertheless the saga and the old Icelandic writings omit to place apples in America; and in fact none were there. Why were not the apples borrowed from Ireland, if the grapes were?

(12) From the Landnamabook it may be naturally concluded that in the eleventh century the Icelanders had heard of Wineland, together with Hvítmanna-land, in Ireland.

Each country may have heard it from the other, both items being common property by that time. Perhaps the name Great Ireland or Whitemen's Land may have a presumption in favor of Irish origin. There can be none for the Irish origin of Wineland. It is likely that Ireland first heard it from Iceland soon after Thorfinn's return to the former.

(13) Thorkel Gellisson, from whom this information is derived, probably also furnished Ari Frode with his statement in the *Islandingabook* about Wineland; this is therefore probably the same Irish land.

He is given as one transmitter of the Ari Marsson story, deriving it from the Earl of the Orkneys. He supplied the Greenland information of Ari Frode, having visited that country; perhaps also some about Wineland. But how can this disprove the existence of the latter?

(14) The Irish happy lands peopled by the *sid* correspond to the Norwegian *huldrelands* out in the sea to the west, and the Icelandic elf-lands.

There is a general correspondence in fairy lore and the like everywhere. But we know that there were real far western islands, as well as dubious and fanciful ones, and that everything between Europe and Asia was held to be an island until after Vesputius.

(15) Since the *huldre*- and *sid*-people and the elves are originally the dead, and since the Isles of the Blest, or the Fortunate Isles, of antiquity were the habitations of the happy dead, these islands also correspond to the Irish *sid*-people's happy lands, and to the Norwegian *huldrelands* and the Icelandic elf-lands.

These mythical folk probably are not always nor usually the "happy dead." Many different elements combine in the fairies and people of the underworld, for example, traditional memories of real aborigines who hid underground; fancies born of the play of light and shade; and ideals of gods fallen from their high estate.

The Fortunate Isles of St. Brandan continued to be called so for at least half a century after they were accurately mapped and well known. Must we suppose that the Genoese and Norman skippers persisted in regarding them as the abodes of the happy dead?

(16) The additional name of "hit Góða" for the happy Wineland and the name "Landit Góða" for huldrelands in Norway correspond directly to the name of "Insulæ Fortunatæ," which in itself could not very well take any other Norse form. And as, in addition, the huldrelands were imagined as specially good and fertile, and the underground, huldre- and síd-people, or elves, are called the "good people," and are everywhere in different countries associated with the idea of "good," this gives a natural explanation of both the Norse names.

Brazil Island, sometimes called the Fortunate Island of the Irish, and St. Brandan's Fortunate Islands, one of which still bears its fourteenth century name of Porto Santo, would influence the ideal no doubt, but we cannot wipe Porto Santo off the map and Brazil probably was as real.

(17) The name "Vinland hit Góða" has a foreign effect in Norse nomenclature; it must be a hybrid of Norse and foreign nomenclature, through "Vinland" being combined with "Landit Góða," which probably originated in a translation of "Insulæ Fortunatæ."

The combination and translation may have happened. It is no more surprising that Insulæ Fortunatæ should be transferred in this way than that Markland should be shifted from one of them to Newfoundland. Either name of the saga may commemorate such a transfer; and either may be a very natural coincidence. A name of mythical association may well be applied, and often has been applied, to a real region. Moreover, the saga is not accountable for this phrase, nor does Adam of Bremen use it. What men reported in the eleventh century should not bear the burden, however light, of adjectives or fancies of the twelfth or thirteenth.

(18) The probability of the name of Skraelings for the inhabitants of Wineland having originally meant brownies, or trolls, that is, small huldrefolk, elves, or pygmies, entirely agrees with the view that Wineland was originally the fairy country, the Fortunate Isles in the west of the ocean.

If so, the word was doubtless applied to the natives in the same spirit that Icelandic men in fight sometimes abusively addressed their opponents as "trolls" for example, see The Saga on the Heath-Slay-

ings. But was it used prior to the voyages of Thorfinn and Leif? If used in Greenland, it might easily be transferred to other savages. It does not seem to prove anything, although, if shown to have a magical implication, it would establish the existence of the same point of view for Eskimo and Indians as for Lapps—in itself not unlikely. Dr. Nansen supplies an excellent precedent in the use of Finn for three races and with implication of magic. But what is the proof that Skrälings originally meant fairy folk and to what period does “originally” refer? Our first introduction to them is through Thorfinn, who trafficked with them as human beings and fought and killed them.

(19) The statement of the Icelandic geography, that, in the opinion of some, Wineland the Good was connected with Africa, and the fact that the Norwegian work, “*Historia Norvegiæ*,” calls Wineland (with Markland and Helluland) the African Islands, are direct evidence that the Norse Wineland was the *Insulæ Fortunatæ*, which together with the Gorgades and the Hesperides were precisely the African Islands.

Not of identity, but of supposed neighborhood in extension; also of a warm climate and luxuriance. This I have said elsewhere. It does not touch the saga, but only the theories of Abbot Nicholas or some one else, and perhaps the general tradition. It was natural that they should think so, if Leif reached the Chesapeake. Since Edrisi in the twelfth century clearly distinguished between the Canaries and the other islands which lay farther at sea, since the classical geographers before him well knew the former, and since the early medieval maps kept and emphasized Edrisi’s distinction, there seems no great probability of any real confusion of identity.

(20) Even though the Saga of Eric the Red and the “*Grönlendinga-páttur*” contain nothing which we can regard as certain information as to the discovery of America by the Greenlanders, we yet find there and elsewhere many features which show that they must have reached the coast of America, the most decisive among them being the chance mention of the voyagers from Markland, in 1347. To this may be added Hertzberg’s demonstration of the adoption of the Icelandic game of “*knattleikr*” by the Indians. The name of the mythical land may then have been transferred to the country that was discovered.

Fortunately the fact that the Icelanders reached the coast of America does not rest wholly on the veracity of the sailors on the small Greenland ship, or on any annal. America was reached by Thorfinn, and more or less explored as far as southern New England. Leif had previously reached the same region and probably passed a long way below it. Our reasons for believing so are fully stated elsewhere.

(21) Hvitramanna-land is a mythical land similar to the Wine-island of the Irish, modified in accordance with Christian ideas, especially, perhaps, those of the white garments of the baptized—as in the “*Navigatio Brandani*” in reference to the Isle of Anchorites or the “Strong Men’s Isle” (= Starkramanna-land)—and of the white hermits.

Dr. Nansen cannot know that it was a mythic land. I do not know that it was not. It may be the American coast below Wineland, for example New Jersey or the Carolinas.

(22) Finally, among the most different people on earth, from the ancient Greeks to the Icelanders, Chinese, and Japanese, we meet with similar myths about countries out in the ocean and voyages to them, which, whether they be connected with one another or not, show the common tendency of humanity to adopt ideas and tales of this kind.

We meet such stories everywhere and no doubt many of them are based on real adventures often wildly distorted. The Zeno tale is in point. It developed into something portentous and inexplicable; and is still in dispute; but most likely they made voyages and encountered adventures, which were a kernel of truth for their repeatedly distorted story. But one ought not to call it a myth, although it contains a short myth as an episode; nor can any light be extracted from it in that way. The voyage stories of different countries have not yet rendered much aid in the Wineland investigation; but it is greatly to be desired that the veil should be lifted from the origin of the names Antillia, Brazil, and others which men call mythical to cover uncertain knowledge.

Some of the above conclusions by Dr. Nansen make in favor of the position taken in the present book; others can hardly be said to weigh either way. Only a minority of the remainder have seemed to need moderately extended treatment, partly because Dr. Nansen is in so many respects in accord with what I had already written and as to others he could be best convinced by showing him the places, flora, fauna, and conditions. It was inevitable that he should make some errors in dealing with foreign and unfamiliar things and very plainly he had never thought of the progressive changes in coast outline during 900 years, nor the difference in nature and distribution between the large wild grapes out of which the early colonists made good wine and the small wild grapes which are tart and more like berries. When Dr. Storm so naturally went astray it is not surprising that Dr. Nansen should do likewise. There are doubtful inferences and conjectures even in von Humboldt. Like many others Dr. Nansen has failed to distinguish adequately between the mountainous northern home of Thorfinn’s party on the bay connected with Straum-

fiord and their much warmer southern home Hóp with its loch and river, marsh-grain and grape-covered hills; though the saga makes the distinction clear, if read without misconception.

His elaborate treatment of the insular myths and legends will find its most abiding value as a study toward elucidating the problem of the Mythical Islands of the Atlantic, closely allied to such questions as those of Great Ireland and Wineland and calling aloud at the present time for a more thorough investigation than has ever yet been attempted.

But we must insist that the Icelanders could never have borrowed from the mass of Irish and antique myths and northern fairy stories such a log-book-like narrative as that of Thorfinn Karlsefni, hitting without fail such a great number of items accurately distinctive of the Atlantic coastline of North America with practically no introduction of European elements except possibly one or two arms and gestures from Norse experience. And if we find the narratives accurate in so very many items, why cannot we believe the voyagers in the reasonable statement that they gave the name of Wineland to a country which surprised them by its luxuriance of grapevine growth and its abundance of large fine grapes good for wine making? Since wild grain in plenty was also there, with plentiful fish and game, shore-birds and their eggs, great trees for house-building and ship-building, wood of finely veined and dotted grain for ornamental work, tall grass excellent for hay and grazing, and, in the more southern parts, a climate so mild as to remind them of the Canaries and Mauritania, why should not they call it "good," even if that word had come to especially imply something supernally fortunate and blessed, as in the case of Teneriffe, Porto Santo, and Madeira?

Such an instance as the sea currents of Straumey and Straumfiord, found nowhere on our coast except in and near Grand Manan, of such notable volume and power and nowhere corroborated by so many coincidences of fact and statement, ought surely to show Dr. Nansen (who expresses no doubt of them) that this saga-narrative can not be mainly the product of old legendary lore and the same is at least equally true of the emphatically and almost exclusively American Wonderstrands.

18.—GENERAL SURVEY

We find, then, that there is no trustworthy record of any Norse settlement in America existing continuously for more than one year; nor of any Norse voyages to America, excepting those of Leif and Thorfinn and the visit of a small vessel more than three hundred and forty years afterward. We may suspect what we will of that long

interval and there is always the possibility that new facts may be discovered; but such is the present status of the question.

We find further that Leif reached the fox-grape-bearing coast of the continent, probably as low as southeastern Massachusetts at the least; that he touched at several points and brought back certain products; that the chances would favor the Gulf of Maine for his storm-driven landfall and a subsequent long run down the shore after the fashion of other navigators; but we know little of the voyage except the general impression of warmth and natural bounty which his report made at home.

We find also that Thorfinn successfully carried his colonists to Labrador, Newfoundland, and Cape Breton, thence along the Atlantic coast of Nova Scotia to the great Bay of Fundy, near which they made their first home, probably on the Passamaquoddy shore and Grand Manan.¹ Afterward they removed to a much more southern spot, and remained there for a year, then returned to the Fundy region, making an incidental exploration of Nova Scotia and the southeastern shore of the Gulf of St. Lawrence, and at last regaining Greenland and Iceland after three years' American experience. Hóp, their most southern point, was either on the eastern coast of New England below Maine or in the basin of Narragansett Bay, with a slight preponderance of probability for the latter.

Besides these voyages, two attempts were made, Thorstein's in 1002 and Bishop Eric Gnipson's in 1121. The former failed, the latter vanished; and nothing ever came of their endeavors.

The three "lands" explored by Karlsefni kept their names until more modern ones were substituted. Helluland soon came to mean all the desolate country above the forest, whether with flat stones or without them, and was a favorite field for later fictitious sagas.

Markland probably stood always for Greenland's nearest supply of growing timber, that is for Newfoundland, perhaps with some vague extension to neighboring shores. The traditional view of the errand of the little ship of 1347 as a timber-gatherer may have originated in a knowledge of prevailing custom or in some unrecorded statement of its crew. If it had not been torn from its anchorage and driven to Iceland we should never have heard of it, any more than of the many others which we may conjecture to have made the trip successfully, escaping or outliving the storms.

¹ Dr. Nansen believes in a visit or visits to these points and an encounter with Indians, not Eskimo, somewhere on the Atlantic coast below Cape Breton; but he is uncertain as to the particular explorers and thinks the name Wine-land wholly mythical, though calling Markland "historic."

Wineland seems to have been understood as beginning with Cape Breton, below the Strait of Cabot, and extending a long way southward. The most general conjecture was that it joined Africa somewhere in the tropics; until the Spanish discoveries made this untenable and later explorations revealed a long coast-line independent of the eastern world and broken by a few deep inlets, the greatest of which was the Chesapeake. Then they pitched upon some such "fiord" as marking Wineland off from America of the Spaniards. But at all times its warmer and more prolific regions made the dominant ideal of the new country among the northern people.

Of course "discovery" in its fullest sense calls not only for finding but for adequate disclosure. But what is adequate in this connection? Must we demonstrate a full understanding of the matter by the more prosperous nations around the Mediterranean, or some effective influence on exploration and colonization in later centuries? It is a matter of definition only, but these requirements would be perhaps a little immoderate.

In Scandinavia the results were so effectually announced that they remained sensational topics of conversation in a royal court nearly seventy years afterward—a court and kingdom very indirectly concerned. The same information was published by Adam of Bremen about the same time in Germany, so amply that manuscript copies of his book were to be found at widely separated points of central Europe for half a millenium afterward. It is incredible that none of them reached Italy, and equally so that the story of the three years' Wineland adventure should not have been freely told there by Gudrid during her eleventh century pilgrimage to Rome, and repeated from time to time by the many Icelandic pilgrims and soldiers of fortune whom we read of in other sagas. Furthermore¹ the tithes for the support of Crusaders were paid by Greenland from time to time during the thirteenth and fourteenth centuries at least, though in a dilatory way; and men who were sometimes sent to collect them must have wonderfully lacked curiosity if they made no inquiry concerning Markland, if only to find out whether it might prove another resource. What they learned would surely find its way back, in general outline, if no more, to the central authority. On all grounds, we must believe that the Vatican was aware of these new western lands, but probably with little more interest than attached to the reports of upper Greenland. That such knowledge should have been possessed and allowed

¹ B. F. De Costa: *The Pre-Columbian Discovery of America*, p. 322 *et seq.*; also most of the other works before cited concerning Greenland.

to lapse away out of mind is no more remarkable than that Edrisi should have known of the lake sources of the White Nile in the twelfth century and drawn them conspicuously on his map; although the unheeding world of Europe forgot them and they had to be laboriously rediscovered seven hundred years afterward. We are learning that the world's memory has had many trances of oblivion.

As to influence on succeeding voyages, Nansen has called attention to the many Scandinavians who had settled in Bristol before the discovery of North America. Storm very reasonably urged long ago the identity of Markland and the Irish Brazil, the quest for which passed from Limerick to this same Bristol; Fischer¹ has treated the same subject rather more conspicuously; and, as we have seen, the fourteenth and fifteenth century maps afford very curious corroborative indications along several converging lines. Moreover, John Cabot in his first voyage turned northward for a time (Payne² thinks to Iceland) from his first westward course, a proceeding that cost him some trouble, according to Sebastian, and which would hardly recommend itself to one who had never heard of discoveries made from that quarter. Also he promptly gave the land³ which he found substantially the name currently in use then, or not very long before, by Icelanders, for some western region of uncertain identity which, on the whole, is most likely to be this same Newfoundland. Finally, soon after his return that summer, as reported by an Italian envoy who was his friend and whose letter is still extant, he and his mercantile backers reported that they thought brazil-wood grew there, this being the characteristic product which was popularly believed to have given the great Isle of Brazil its name. Everything goes to prove that he had the former Irish and Icelandic voyages and legends in mind, and that these and like influences would soon have impelled him or some other to success along this line, even if there had been no Spanish discovery of the Antilles.

Apart from this effect in Britain, Adam of Bremen's account of Wineland and its products was circulating in print from Holland before the seventeenth century, and Ortelius also was presenting Wineland by name as a Norse discovery identical with Estotiland, in theorizing about the origin of the American Indians; while in Iceland itself there was a continuous succession of sagas and other works touching the subject, oral, written and printed, original and

¹ The Explorations of the Northmen, etc., p. 105. Cf. E. J. Payne: History of America.

² As above, p. 233.

³ E. J. Payne: History of America, p. 217.

copied, besides the entries in the annals, until more modern kinds of books took up the task of preservation and exposition, the first formal History of Wineland, that of Torfaeus, appearing in 1705. Since that time there has never been a total dearth of such literature, nor any real break in the chain. Surely in all this we have disclosure, not indeed at all times voluminous, but extending over a great area and through the march of centuries. Is not this, following the actual finding of our coast and its partial exploration, quite enough to justify the use of the word discovery?

This does not diminish the merit of Columbus in rediscovery, primarily for the benefit of Latin peoples and with no aid from the northern sources, which he and they agreed in holding lightly. While in "Frisland" or Iceland or during his dubious voyage yet farther westward, he may well have heard of Wineland; but if so he has given no sign; and he surely would have used it against his adversaries had he recognized an available argument. There simply was nothing in the tradition which savored of Ind or Cathay; and he was as far as could be from the ambition to discover a new continent. Its existence appeared so dreadful a negation of all his hopes that he would not admit it, even when suspicion must have been haunting him; but compelled his followers by cruel and extravagant threats to join in an affidavit that they had reached Asia instead.

It has also been lightly said¹ that the Norse journeyings up and down our coast compare with the voyages of Columbus as the sport of children with the achievements of men. But is this true? The chief motive of Leif was to carry the gospel of Christ to his Greenland home, at the same time rejoining those of his blood from whom he had been long parted; this he effected perfectly and promptly, incidentally presenting the data which he had collected, as the result of an accidental discovery and hasty explorations on the way. The chief motive of Thorfinn was exactly that which we admire in our first, hardy, English-speaking settlers, the finding of new homes for their families and incidentally upbuilding a new country. He failed in this, because the odds were too heavily against him, not from any lack of competent planning or sturdy endeavor; and he brought back from Wineland a notable accession to human knowledge, besides adding another heroic figure to the picture gallery of human effort. The chief motive of Columbus was to find a shorter route to Asia, with consequent profit and glory to his sovereign and himself, and a wider opportunity for converting the heathen. He failed utterly in

¹ J. Fiske: The Discovery of America.

his immediate aim. Yet he brought the New World into the light and demonstrated that the Sea of Darkness was no formidable barrier.

Which of the three should stand foremost is debatable, depending largely on the "spectacles of the judge." Perhaps we may fairly say that Thorfinn was the most practical and modern; Leif, the most unselfish and exempt from failure in what he aimed to do; and Columbus the most picturesque, the most conspicuous, and the most important for the future.

It was the ill luck of Leif the Lucky and Thorfinn the Promising to discover and begin exploring America before the world was ready. The Genoese came with the rising tide of modern life and it ensured that his work should go on after him. But neither Columbus nor Leif made any radical change in the course of the world's history.

If he had remained in Spain, and so found nothing in 1492, Cabral, rounding out too far from Africa in his East Indian voyage, would quite as certainly have struck the South American coast in 1500. By then, too, or not long afterward,¹ success would surely have come as well to the plucky and persistent merchants of Bristol and their captains, who had twice essayed before 1480 to reach that Brazil which probably included Markland and had repeated² such attempts annually or oftener for some seventeen years, until the successful one landed them with Cabot on the American mainland before either Vespuccius or Columbus. Possibly mankind might have prospered even better if sixteenth century access to the new world had been by this upper gate alone. No doubt many records would be preserved which went up in flames before Spanish bigotry; and it is hardly imaginable that the native semi-civilization could have fared worse. At any rate, toward the end of the fifteenth century the speedy discovery of America was quite inevitable.

The situation has never been paralleled. Europe, so long facing eastward, had turned about the other way and was all alive on its Atlantic front. Besides the swarm of Basque, Breton, and Norman fishermen, continually urging their industry farther afield, there were three lines of approach, making a gigantic race of most absorbing interest, across the great sea. At the north, English seekers after the half-forgotten memories of our race which had turned to myth; in the middle, a man who sought a certainly known goal by an impossible route; below him, the Portuguese navigators, who well

¹ J. Winsor: Narr. and Crit. Hist. of America.

² Letter of Soncino given in original Italian and translation by G. E. Weare. before cited.

knew both route and goal, but swayed out into the unknown ocean on their loose-flung way, with altogether unsuspected opportunity for great discovery; and all the time the long-waiting double continent barred every path and was by no means to be missed. It was a mere question of miles and degrees and of first overcoming them. The man of the middle line won and is rightly praised for his persistence and successful endeavor, as well as for his wide views of the problems then confronting mankind.

But in Leif's time there was no European pressure westward except that of the sparsely populated adventurous Scandinavian North, and this did not wholly suffice. The wave touched Wineland but soon receded; even falling back several centuries later from Greenland also, after a wonderfully tenacious occupancy, while the rest of the world hardly perceived the loss. But a discoverer is not in fault for the lack of wit of his generation. He should not be deprived of his honors by any overstraining of language. Leif Ericsson, or Thorfinn Karlsefni, if we follow Dr. Nansen in doubting Leif, remains the first authentically recorded discoverer of America. Gudrid, his wife, holds her place as the first white American mother, and their son, Snorri, is sufficiently well attested as the first-born white American.

NOTES.

- 1 (p. 20). Thus Peter Martyr believed—"the cosmographers well considered" that Columbus reached "The Islands of Antillia" (Peter Martyr d' Anghiera: *The Decades of the New World* (1511); Eden's translation (1555), the First Decade, pp. 2, 3). Cf. A Portuguese anonymous map of 1502 shows the "Antilie" applied to Cuba and neighboring islands by explicit inscription.
- 2 (p. 21). The peasantry and fisher folk of the Arran Islands still call it the Great Land (Westropp: *Brazil and the Legendary Islands of the North Atlantic*, 1912, p. 257).
- 3 (p. 22). Perhaps montonis originally was montanis (mountains, Italian); as we know that Pareto's Roillo had been Reylla—besides other like instances of accidental change. I. de Montonis—the Isle of Sheep: which is conspicuous in the sea-tales of St. Brandan and the Magrurin of Lisbon.
- 4 (p. 24). Westropp, in his very recent work on Brasil and the Legendary Islands of the North Atlantic, published by the Royal Irish Academy, 1912, p. 255, mentions a mythical King Breas and a missionary Bresal of about the year 480 and suggests that Brasil may have been named after the latter; also Hardiman's *The History of Galway*, p. 2, quotes from one of the 16th century Four Masters, who compiled much older material, a mention of Breasail (apparently a pagan Gaelic hero or deity), having a very ancient look, but there seems a lack of data to fill the wide gap between the fifth and fourteenth centuries. The Italian and Catalan maps of the fourteenth and fifteenth centuries generally present the name as I. de Brazil, sometimes Y de Brazil, with divers variations in orthography, such as Berzil, Brazi, Bracir and Buxelle, beside those given below.
- 5 (p. 25). The word Bracile (obviously Brazil) occurs in a treaty or compact of peace and trade, dated 1193, between the "Bononienses and Farrarienses," copied into volume 2 of *Antiquitates Italicae Medii Aevi* by L. A. Muratori, beginning at page 891. In a list of specific commodities embodied in this compact, and including indigo, incense, wax, and certain hides or furs, we find also (p. 894) "drapis de batilicio, de lume zucarina, *de grana de Brasile*." On page 898 Muratori mentions that a deed of the year 1198 uses the same words "*grana de Brasile*." The use of the word "grain" on two occasions in different kinds of documents at an interval of five years cannot be an accidental error. There is nothing to hint at any confusion with woods or dyes. The name suggests "blé Turquoise" for maize and other like names of a later time. We must suppose that Brazil was believed to be a country capable of supplying a distinctive grain and that the grain in question had acquired a settled name of commerce at this early date. The *Memorias Historicas sobre la Marina Comercio y Artes de la Antigua Ciudad de Barcelona*, by Antonio de Capmany y de Montpalu in Vol. 2, presents a series of copies of orders or regulations

establishing impost and seignorage tariffs for different ports and of course mentioning many commodities. On pages 4, 17 and 20 are found in separate documents "carrega de Brasil," "faix de bresil"; and "cargua de brazil," the earliest dating 1221, the second 1243 and the third a little later in that century. As they accompany sugar, paper, alum, perfumes, wax, and other miscellaneous goods, nothing can be inferred as to the meaning of the word except that brazil was some generally recognized and packaged article of Catalan trade. In one list grain is mentioned generally and separately, but this need not exclude brazil from being some special grain. Also the words "de qualibet centeria de brasile venali" occur in a 1312 grant of murage rates to Dublin—Patent Roll V. Edw II, Part 2 m 7, as quoted in a recent letter by Mr. Westropp, author of *Brasil*, etc. But, as he says, it has no necessary relation to dye-woods. It may obviously mean any commodity associated with "Brasil."

- 6 (p. 26). Several old maps show the main island of the Bermudas exaggerated, and of approximately crescent form, for example, that of F. de Witte, 1660, and another in the U. S. National Museum, unnamed and undated, but bearing 1668 as its latest discovery entry and belonging apparently to the early eighteenth century.
- 7 (p. 38). In point of fact this same feat of blending all the Faroes in one with change of place had been performed long before, as appears from an eleventh century map in the British Museum reproduced by Santorem, presenting Ysferi (apparently meaning Island of Fari) as a large island west or northwest of Ireland. Of course Y was a common equivalent of I (Insula) and the name was currently changed slightly, for example, to Frisland by Christopher (or Ferdinand) Columbus as well as Nicoló Zeno.
- 8 (p. 40.) Mr. V. Stefansson has recently reported certain Eskimo of white racial characteristics on Coronation Gulf near the middle of the top of the continent, with the suggestion that they may possibly be descendants of these Greenlanders. But there are several other ways of accounting for the phenomenon, though perhaps none is perfectly satisfactory, and until we have further light on the subject the safest plan is to treat it as irrelevant.
- 9 (p. 109). A more recent interpretation (the Athenæum, London, September, 1912), derives two of the Skrelling words from Eskimo. The Athenæum says: "M. Henri Cordier in the current number of the *Journal des Savants* calls attention to a proof of the discovery of America in the eleventh century which has hitherto passed unnoticed. In the Saga of Eric the Red it is said that when Thorfinn Karlsefni returned from 'Markland' or Newfoundland, in 1005, he took back to Greenland with him two children from the northern land of the Skrælings, and four words of their language are preserved in the Saga. These words were thought by the Greenlanders to be the names of the children's parents or chiefs; but M. Cordier shows that they can be traced to Esquimaux phrases of the present day, two of them meaning something like 'Wait a moment' and 'the Northern Islands' respectively." But Dr. Nansen's derivation of these words from the Norse has a more persuasive air. Since the Icelanders apparently lent their

legends to their captives or read them into the utterances of the latter we may well suppose a like contribution of words or a transformation beyond any retracing.

- 10 (p. 118). James Wallace in "A description of the Isles of Orkney," 1693 (John Small, editor, 1886), p. 5, writes, "In this firth about two miles from Caithness lies Stroma a little isle" and a note probably by Malcolm Laing adds, "*i. e.*, Straum Island from the furious streams that pass by it." The name Straumey occurs also at divers points around the coast of Iceland according to the late Mr. Steingrímur Stefánsson, an Icelander. Cf. Debes (L. J.): *Faroe and Faeroa Referata*. (Description of the islands and inhabitants of Faroe.) Translated by J. S., "Osteroe and Stromoe are as it were bound together by a ground, over which runs a very rapid stream From this stream it is that Stromoe is so called."

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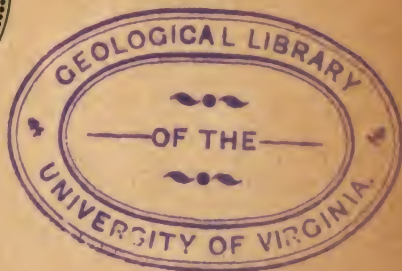
THE RECOGNITION OF PLEISTOCENE FAUNAS

BY

OLIVER P. HAY



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THE RECOGNITION OF PLEISTOCENE FAUNAS¹

By OLIVER P. HAY

The determination of the history of the faunas and floras of a great region like North America in a geological period such as the Pleistocene, during which there were numerous and extreme changes of climate, great variations in elevation and therefore in rates of erosion and redeposition, in cold and heat, in rainfall and drought, in kind and amount of food and shelter, is a most difficult subject. The botanists, of course, have their special troubles, but the student of the Vertebrata labors, perhaps, under greater difficulties. The species which he studies are rarely represented by complete skeletons, most of them by scattered teeth and disassociated bones. Most of his species lived on land and the individual animals usually perished without leaving a trace of themselves.

As in the case of other geological periods, the unraveling of the history of the living beings of the Pleistocene has had to await a somewhat accurate knowledge of the geology. On account of the fact that in the larger part of the region studied in North America the deposits are usually disconnected and relatively little differentiated, while another region has been subjected to glaciation, a perplexing phenomenon, it has been difficult to determine the relations of the formations as regards synchronism and succession. The labors of geologists have made great breaches in the wall that stands between us and complete knowledge, but an enormous amount of work is yet to be done.

In the first edition of Dana's *Manual of Geology*, published in 1863, this great author divided the Post-tertiary, equivalent to the term Pleistocene, into two epochs, the Glacial and the Champlain. The latter was followed by the Terrace epoch, "a transition epoch, in the course of which the peculiar Post-tertiary life ends and the Age of Man opens." As to the life of the Post-tertiary Dana says (pp. 458-459):

The Drift epoch in America has afforded no organic relics except half-fossilized wood. There is as yet no evidence of any quadrupeds until the milder Champlain epoch had set in.

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That statement was not changed in the second edition, published in 1864.

In the third edition, 1874, the term "Terrace epoch" is replaced by the expression "Recent period" and this is divided into "the Reindeer, or second Glacial era," and "the Modern era." The term Quaternary is employed to include the Glacial, the Champlain, and the Recent eras. Most of the species of fossil mammals found within the glaciated areas were regarded as having lived during the Champlain, but the opinion is expressed that such mammals may have existed during the Glacial epoch beyond the borders of the ice-covered region.

In the fourth edition of this work, published in 1895, the same classification of the Quaternary is employed and the opinion is held that the animals which spread themselves over the glaciated area during the Champlain had probably all been in existence during the middle and later parts of the Glacial period, if not earlier.

In 1895, Cope (Amer. Naturalist, Vol. 24, p. 593), in discussing the antiquity of man in North America, expressed the opinion that there had existed during the Pleistocene two distinct faunas, one of which he called the *Megalongy* fauna, the other, the *Equus* fauna. The *Megalongy* fauna included the genera *Platygonus*, *Smilodon*, *Megalongy*, *Myiodon*, *Mastodon*, and extinct species of *Bos*, *Dicotyles*, *Equus*, *Tapirus*, *Ursus*, *Castor*, *Arvicola*, and *Lagomys*. With these were found teeth and other fragments of a number of animals yet existing. The *Equus* fauna included extinct species of horse, species of *Myiodon*, four species of camels, and a peccary. *Elephas primigenius* was abundant; the mastodon rare, if occurring at all. The *Equus* beds which contain this fauna are said to be found in Oregon, Nevada, California, southern Texas, western Nebraska, and part of Mexico. His *Megalongy* fauna was regarded as having occupied the region east of the Great Plains. Cope recognized the fact that in both these faunas there was a South American element. This element contained the great edentates, the saber-tooth cats, the peccaries, tapirs, and probably the giant beaver. He concluded that the two faunas were contemporary and had existed during pre-Champlain time. After the Champlain, which Cope regarded as a time of submersion, there came in a new fauna consisting mostly of now existing species, but containing also a few of the pre-Champlain forms, among them one or more species of *megalongy* and the giant beaver.

Chamberlin and Salisbury, in their Geology, recognize a number

of glacial and interglacial stages, and they express the view that during the interglacial times the glaciated regions were occupied by numerous animals, among them many mammals. During the glacial stages the animal and vegetable life was pushed southward, and at each interglacial stage, it again migrated northward. The authors likewise recognize the fact that there was a strong tropical element in the fauna, made up partly of the great edentates and peccaries. A northern element is believed to include the mammoths, mastodon, bear, bison, reindeer, and musk-ox. Mingled with all, in mid-latitudes, were forms on the verge of extinction, horses, tapirs, llamas, and saber-tooth cats.

In his *Age of Mammals*, 1910, Osborn adopts, in general, the views of Cope, recognizing, however, four faunas, which he named the fauna of the first or *Equus-Myiodon* zone; the fauna of the second, or *Megalyonyx* zone; the fauna of the third, or *Ovibos-Rangifer* zone; and that of the fourth, or *Cervus* zone. The latter fauna is that which existed at the time of the discovery of the continent by Columbus. The third fauna includes the musk-ox (*Ovibos*), the reindeer, the mastodon, the hairy mammoth, and several species of bison. The first and second faunas seem to be practically the corresponding ones of Professor Cope. Professor Osborn holds that the *Equus-Myiodon* fauna occupied the dry Plains regions, but also the coast of Florida (p. 452), while the *Megalyonyx* fauna had possession of the forested regions of the eastern part of the United States and of the Pacific coast (p. 467). Professor Osborn, like other students of the subject, recognized a South American contingent in both of the earlier faunas.

As to the time of the existence of the *Equus-Myiodon* and the *Megalyonyx* faunas, Osborn (p. 454) is inclined to believe that they were to a great extent contemporary, but that probably early phases of the *Equus-Myiodon* fauna antedated the beginning of the *Megalyonyx* fauna.

In 1909 (*Science*, Vol. 30, p. 890) the present writer called attention to the fact that no trustworthy discoveries of remains of extinct horses had been made in deposits lying above the Wisconsin drift, and he reached the conclusion that these animals had, in our country, by that time, become extinct.

Since that time the author has pursued the subject, and he wishes here to present additional facts and conclusions. To aid in this undertaking, he has prepared a base map of the mid-latitude regions of North America, and represented on it the distribution of

the various glacial sheets. In preparing this he has made use of the maps in Leverett's Monographs 28 and 41 of the U. S. Geological Survey, and of a map in the office of Dr. W. C. Alden, of the Survey, on which map is shown the distribution of the drift of different stages in the region west of that considered by Leverett in the works mentioned. On the maps here shown the various drift-sheets are mapped as accurately as is possible on a scale so small. The drift-sheet most important for our purpose is the Wisconsin. This sheet covers more or less completely Labrador, Nova Scotia, and New England; while farther west it extends southward to a line running through Pennsylvania, a part of New York, Ohio, and Indiana. Near the center of Illinois the line turns northward into Wisconsin, where it passes to the east and north of a driftless region. A great lobe of the sheet descends in Iowa to Des Moines, and in eastern South Dakota is seen a smaller lobe. Thence the southern border of the sheet continues westward to the Pacific coast in Washington.

In Ohio and Illinois the Illinoian drift-sheet extends southward beyond the edge of the overlying Wisconsin. In northeastern Iowa and the adjoining part of Minnesota is found the exposed part of the Iowan sheet. West of the Mississippi River the Kansan sheet extends southward beyond the Wisconsin, and a fringe of it is seen along the western border of the driftless region of Wisconsin and Iowa. The Nebraskan drift-sheet is wholly covered by the later ones and is not shown. The various drift-sheets are theoretically separated more or less completely by interglacial deposits. It may be convenient to have the order shown here in which the glacial and interglacial stages succeeded one another. The interglacial stages are italicized.

9. Wisconsin.
8. *Peorian*.
7. Iowan.
6. *Sangamon*.
5. Illinoian.
4. *Yarmouth*.
3. Kansan.
2. *Aftonian*.
1. Nebraskan.

On these maps it is proposed to indicate where remains of various Pleistocene mammals have been discovered. The writer has endeavored to make a thorough examination of the literature on the subject, and believes that very few mentions of discoveries of the

forms here treated have escaped him. He has, besides, examined a considerable number of collections in our museums and universities and noted the materials found in them.

Figure 1 is intended to show the distribution of the American mastodon (*Mammot americanum*). The writer has records of over 325 finds of this animal. In some regions, as New York and Indiana, it is impossible to indicate on the map all the localities; hence, one dot represents often two or more neighboring localities. In Indiana more than 30 are known. While the remains of this great proboscidian have been found from Cape Breton Island to the Pacific coast and to Florida and Texas, they are seen to be especi-

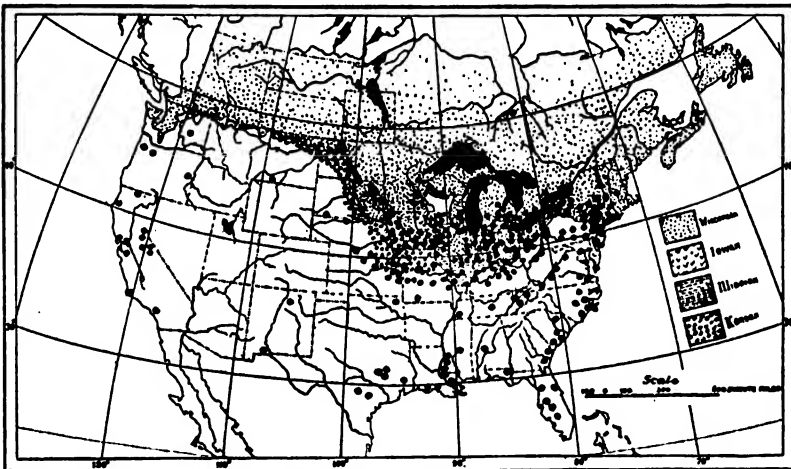


FIG. 1.—Distribution of the Pleistocene mastodon, *Mammot americanum*.

ally abundant in undisturbed deposits that were laid down in lakes and ponds on the Wisconsin drift. It is certain, therefore, that the animal lived in those regions long after the last ice-sheet had retired from the country. Inasmuch, too, as teeth and bones not yet distinguishable from these post-Wisconsin mastodons have been found in Aftonian deposits, we must conclude that the species inhabited parts of the country during nearly the whole of the Pleistocene.

Figure 2 represents the distribution of known discoveries of the hairy mammoth (*Elephas primigenius*). The number is not large, but it is intended to indicate specimens that have been determined with considerable certainty. The writer has notes on more than 200 discoveries of remains of elephants which cannot be assigned

with any certainty to either *E. primigenius* or *E. columbi*, being accompanied by neither description nor figure. From the map it will be seen that most of these finds of *E. primigenius* lie on some one of

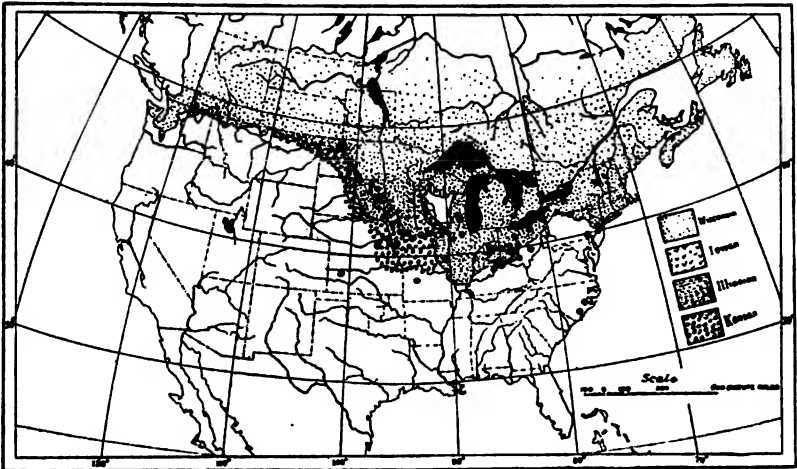


FIG. 2.—Distribution of the hairy mammoth, *Elephas primigenius*.

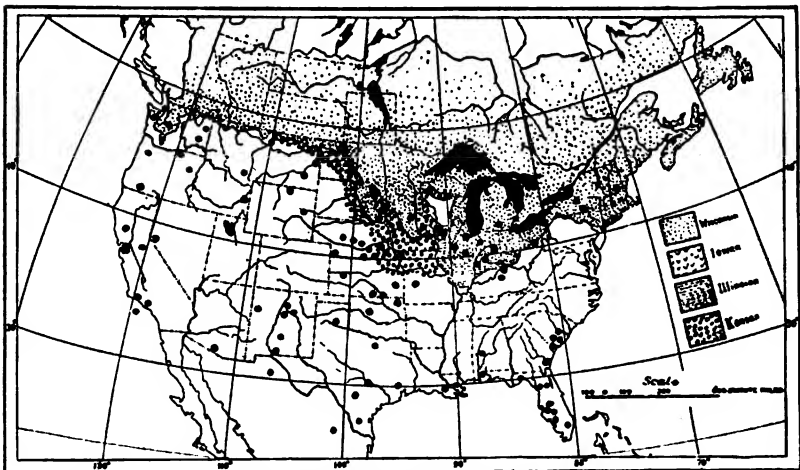


FIG. 3.—Distribution of the Pleistocene elephant, *Elephas columbi*.

the drift-sheets or not far away from them. Two cases occur in North Carolina. Possibly, at the height of some glacial stage, some individuals, that found a congenial dwelling place on the mountains of this region spent their winters on the sea-coast. It is especially

to be noted that several localities are on Wisconsin drift and the remains were found in muck and peat of old marshes. It cannot be doubted that the animal lived in post-Wisconsin times.

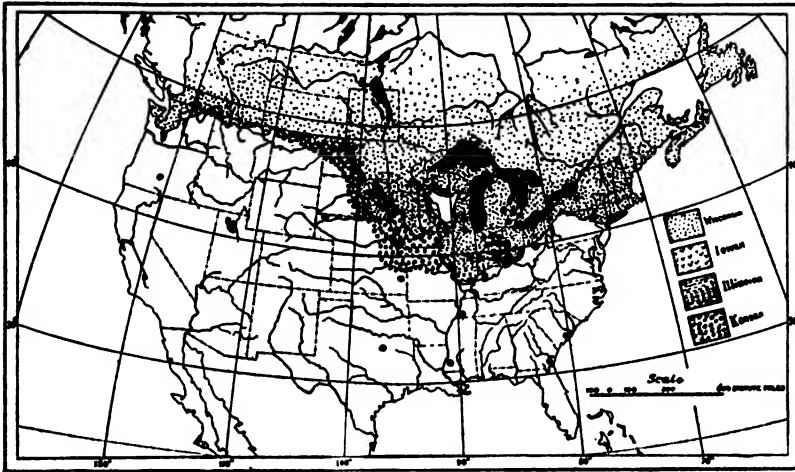


FIG. 4.—Distribution of the Pleistocene giant beaver, *Castoroides*.

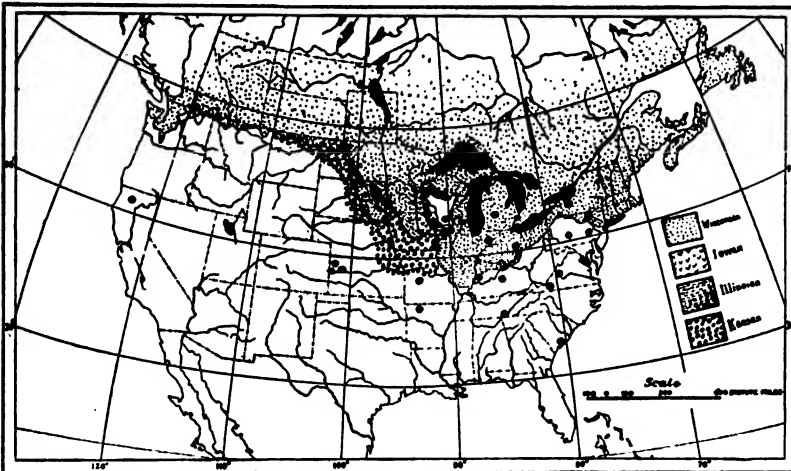


FIG. 5.—Distribution of Pleistocene peccaries.

Figure 3 is intended to represent localities where remains of *Elephas columbi* have been discovered. It is evident that also this species lived after the last ice-sheet had withdrawn from the country. Inasmuch as this animal extended its habitat to the Gulf of

Mexico, it seems probable that it was a species that affected a warm climate; and that it made its way into the northern States only after the climate had become quite mild.

Figure 4 shows the distribution of known specimens of the giant beaver, *Castoroides*, except that it is now known to have lived at one time on the Old Crow River in Yukon Territory. The map shows that it was well represented in the old swamps that formed on the top of the Wisconsin drift-sheet in Ohio, Michigan, and Indiana.

On the next map (fig. 5) are shown the localities where remains of extinct species of peccaries have been discovered. The existing

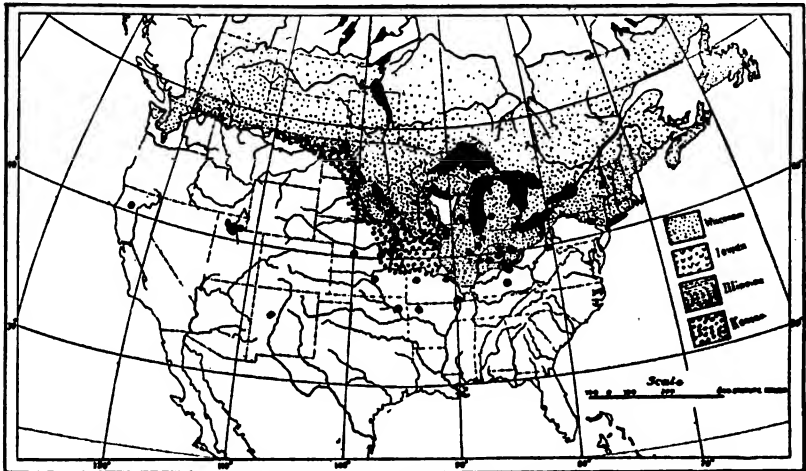


FIG. 6.—Distribution of Pleistocene musk-oxen.

members of this family range from Texas to far down into South America. In Pleistocene times, so far as shown by specimens, they hardly came so far south as Texas. Several specimens have been found in deposits overlying Wisconsin drift, as in New York, Ohio, Indiana, and Michigan. That these animals existed in these States long after the last glacial ice had disappeared, there can be no doubt.

Figure 6 is intended to represent the known distribution of musk-oxen in mid-latitudes during the Pleistocene. The writer has records of over 30 specimens. These belong to 4 or 5 genera. Among the species is an *Oribos* not yet distinguishable from *O. moschatus*. Four specimens are known: One from Youngstown, Ohio; one from Richmond, Indiana; a third from northeastern Iowa; and a fourth from southeastern Iowa. The Indiana specimen, secured by

Prof. D. W. Dennis, certainly came from post-Wisconsin deposits, while the Youngstown, Ohio, specimen was found within the area of the Wisconsin drift-sheet. Specimens of *Symbos cavifrons* are most numerous, and several of these are found above Wisconsin drift, especially in Indiana.

The next map (fig. 7) shows the distribution of the great edentates, belonging mostly to the genera *Megatherium*, *Myiodon*, *Paramylodon*, and *Megalonyx*. It will be observed that the localities lie almost wholly south of the border of the Wisconsin drift. However, there is in the collection of the Ohio State University a mounted skeleton, to a considerable extent restored, which was

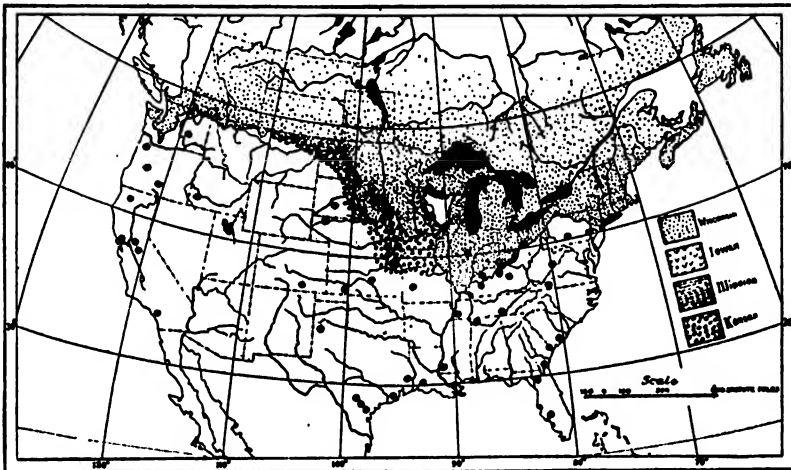


FIG. 7.—Distribution of Pleistocene gigantic edentates.

discovered several years ago, near Millersburg, Holmes County, Ohio. Here the terminal moraine of the Wisconsin ice-sheet had dammed back the water, and formed north of it a lake that eventually became a marsh, and in this, about a mile north of the moraine, was found a part of the skeleton of *Megalonyx jeffersonii*. This existence of *Megalonyx* after the Wisconsin ice had withdrawn from the Great Lakes region, is confirmed by the finding of a claw of probably the same species above Wisconsin drift near Champaign, Illinois. None of the other genera of this order has yet been found at so high a geological level in the glaciated region.

These maps, therefore, furnish us with incontestable evidence, that, after the passing away of the last glacial ice-sheet and yet within Pleistocene time, the country had become fitted for animal

life, and that creatures of such different habits of life, as the mastodon, the hairy mammoth, the Columbian mammoth, the giant beaver, one or two genera of peccaries, at least three species of musk-oxen, belonging to as many genera, and a species of megalonyx invaded and took possession of the new-made land. We do not need to suppose that all these occupied the country at the same time. It seems probable that the hairy mammoth and the musk-oxen followed up pretty closely the retreating ice-sheet, while the Columbian mammoth, the mastodon, the giant beaver, the peccaries, and the megalonyx pushed in only after the climate had become greatly ameliorated. It cannot be doubted that a host of other but

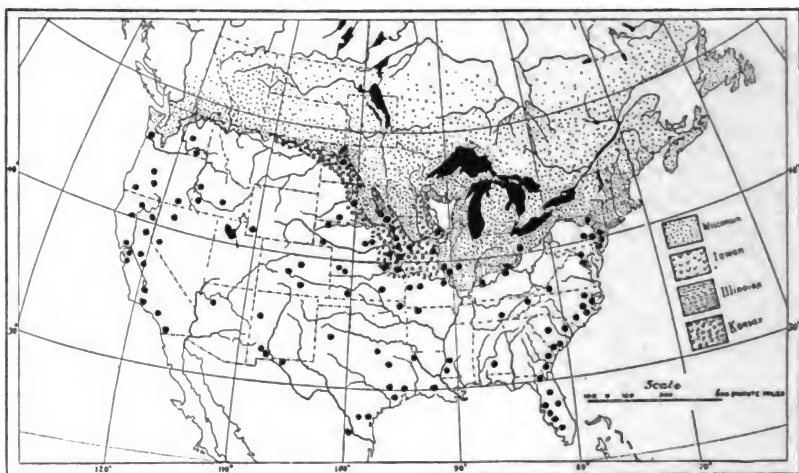


FIG. 8.—Distribution of Pleistocene horses of the genus *Equus*.

smaller mammals, as well as reptiles, amphibians, and fishes, accompanied each of these groups, the cold-loving and the heat-loving, and it will need close observation of the materials thrown out of ditches and canals in the region covered by Wisconsin drift, in order finally to make out what these animals were.

Figure 8 presents, so far as known, a view of the distribution of fossil horses, of the genus *Equus*, during the Pleistocene epoch. The writer has records of more than 130 localities where extinct horses have been found in North America, including Alaska and excluding Mexico. Now, there occur within the area covered by Wisconsin drift only two authentic discoveries of remains of extinct horses. One of these is on the Susquehanna River, near Pittston, about 20 miles north of the terminal moraine. Leidy stated

that the two teeth which he described had come from a stratum full of bones. So far as the writer knows, there is nothing opposed to the idea that the deposit along this river, as in the case of some others, had been made at some time prior to the Wisconsin epoch. Certainly, the deposit needs investigation.

The other locality referred to is Columbus, Ohio. As long ago as 1848, Whittlesey reported the finding of bones and teeth of a horse here, but they were lodged in fissures or clay-seams of the limestone. They might have been deposited there at any time during the Pleistocene. In 1875 Mr. J. H. Klippart reported that the fossil jaw of a horse, with molars in good condition, had been

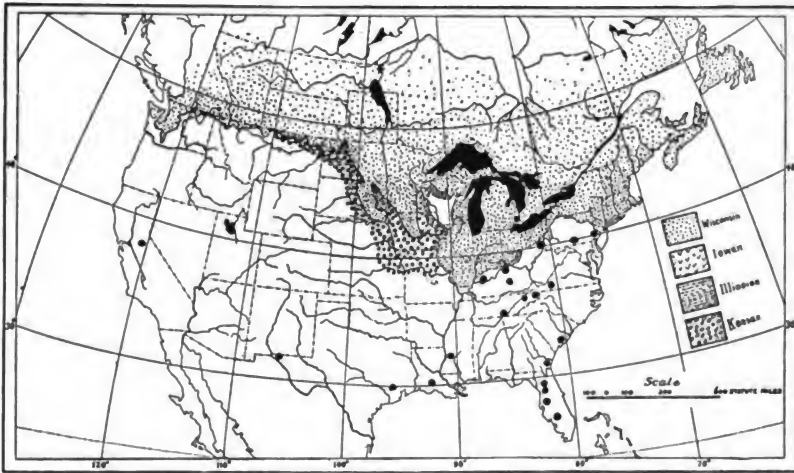


FIG. 9.—Distribution of Pleistocene tapirs.

found while excavating for the exterior wall of the penitentiary. Unfortunately we are not told what the depth was, nor the character of the deposits where the jaw was found. The penitentiary is not far from the banks of the Scioto River, and the deposit with the included jaw, if post-Wisconsin, may have been derived from a pre-Wisconsin bed; but more probably, this deposit is of older date than the Wisconsin stage.

It is very interesting to study the distribution of the fossil horses, with respect to the Wisconsin drift. They appear to have extended northward to the south boundary of this drift all along the line without having crossed it, except in the two cases mentioned. There can hardly be a doubt that if this drift could be cleared away, horse remains would be found beneath it far northward, and such remains

are sometimes likely to be met with in digging wells and in places where streams may have cut through the Wisconsin, so as to reach an underlying interglacial deposit. And this suggests that, in the case of every discovery of a Pleistocene fossil, accurate record should be kept of the exact locality, and of the depth and the character of the deposit. Especially ought the record of the locality to be so detailed that anybody can relocate the exact spot.

The next map (fig. 9) shows the relatively few localities where tapir remains have been found. None of these occur north of the Wisconsin terminal moraine; in fact, none north of the border of any glacial sheet, except at Big Bone Lick where a thin varnish of the

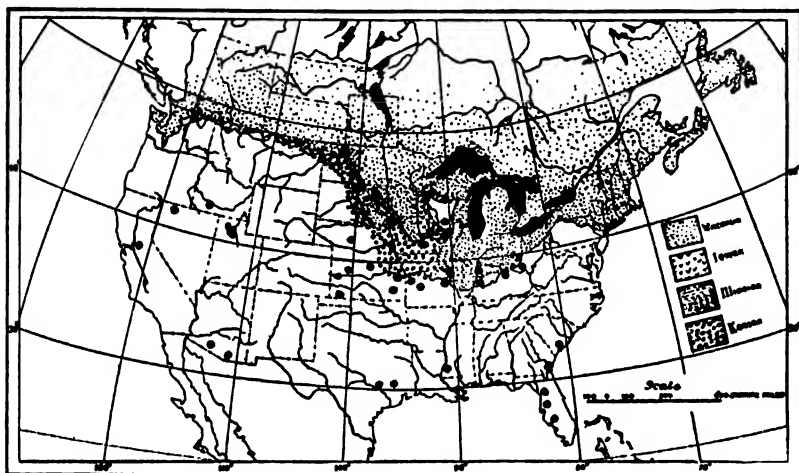


FIG. 10.—Distribution of extinct species of bison.

Illinoian sheet covers the locality. It is doubtful whether the relation to the Illinoian drift of the tapir remains found there can yet be determined.

Figure 10 is intended to display the distribution of localities where bisons of extinct species have been found. The writer holds that no authentic discovery of an extinct bison has yet been made in deposits overlying Wisconsin drift. To prove the presence of such a bison it will usually not be sufficient to present teeth only, for the teeth of some of the extinct bisons resemble so closely those of the living species that they cannot be distinguished. As in the case of the horses, remains of undoubtedly extinct bisons have been found close up to the border of the Wisconsin drift, and doubtless will yet be found to occur beneath it.

What conclusions are we to draw from the facts presented regarding the horses, the tapirs, and the extinct bisons? To the writer it seems almost necessary to believe that the species of *Equus*, of *Tapirus*, and of *Bison*, except *Bison bison*, had become extinct before the Wisconsin ice-sheet had retired from its southernmost limit. Here was a tract of country stretching from the Atlantic to the Pacific, finely adapted to support a varied fauna, but, if horses and tapirs, and bison existed, they came up to the border of this fertile land, and, excepting the living bison, did not venture to pass this border. To them it was a dead-line; if, again, they existed.

To the writer, basing his opinion especially on what the maps shown above have revealed, it appears justifiable to make a distinction between the fauna which occupied this country when first visited by white men, which may be called the Recent fauna, and that which immediately preceded it. The latter included many genera and species that are found in the Recent fauna, but it embraced also a species of megalonyx, the American mastodon, at least two species of elephants, the giant beaver, one or two extinct genera of pecaries, at least three extinct genera of musk-oxen, and the extinct moose, *Cervalces scotti*. The latter belonged here, for the fine skeleton which is at Princeton University was found in swamp deposits in northern New Jersey which overlies Wisconsin drift. The distinguishing genera of this fauna are probably better revealed in the northern part of Indiana than in any other State, and especially in the valley of the Wabash River and its tributaries. The beds containing these fossils hold the same relation to the Wisconsin drift that each of the interglacial deposits holds to the drift sheet underlying it. Inasmuch as it has this definite position and, moreover, contains a fauna marked by a number of extinct genera, it seems to be worthy of a distinctive name. It is proposed, therefore, to call these deposits, consisting mostly of the fillings of old marshes, ponds, and lakes, the *Wabash* beds, and the fauna contained therein, the *Wabash* fauna. As the type locality of this formation, the writer chooses the region about 4 miles east of Fairmount, Grant County, Indiana. Here in a drainage canal which empties into the Mississinewa River, a tributary of the Wabash, at a depth of from 12 to 15 feet, was found the nearly complete skeleton of *Elephas primigenius* which is mounted in the American Museum at New York. Somewhere in the neighborhood was found the partial skeleton of *Castoroides* which is in the Field Museum of Natural History,

Chicago. In the 13th Annual Report of the Indiana Geological Survey, on page 143, it is stated that some years ago the tooth of a mastodon was found in one of the marshes south of the lake in the eastern part of Fairmount township, a lake that has been greatly reduced, now possibly obliterated, since the time of settlement of the region by white men.

The Pleistocene fauna which occupied our country before Wisconsin time differed in many respects from that of the Wabash stage. It embraced edentates of several extinct genera, *Megatherium*, *Myiodon*, *Megalonyx*, and *Paramylodon*; horses of several species; a number of genera and species of camels; tapirs; bisons of a number of extinct species; peccaries belonging to the genera *Platygonus* and *Mylohyus*; bears of the extinct genus *Arctodus* and extinct species of *Ursus*; saber-tooth cats of more than one genus; some extinct dogs; and various other forms, besides many genera and species yet in existence. The question arises: Can this assemblage be divided into two or more faunas? It would appear possible to do so when we consider, on the one hand, the Port Kennedy collection with its 80 per cent of extinct species, and the Hay Springs collection with about 70 per cent extinct, and, on the other hand, the Conard fissure collection with only 47 per cent of extinct species.

The latter has been referred by Professor Osborn to his third, or Ovibos-Rangifer zone, of which he says: "The third mammalian fauna is apparently that of the final glacial advance and, perhaps, of a cold dry loess period" (Age of Mammals, p. 440). Arguments may be offered to support this assignment, but the high per cent of extinct genera and species, among them horses and saber-tooth cats, makes it more probable that it is to be referred to the Illinoian stage, whose ice-sheet approached much nearer the locality than did the Wisconsin sheet. The absence of edentates and proboscideans probably means nothing in this respect, for both were represented after the Wisconsin.

If the contents of the Conard fissure are rightly assigned to the Illinoian stage, the number of extinct forms at the onset of the Wisconsin stage must have been far less than 47 per cent—a conclusion that seems to be reasonable. It would then appear to be possible to divide the pre-Wisconsin Pleistocene mammals into two faunas, an earlier and a later; but when the attempt is made it is not found to be so easy, and, if done at all, can be done only provisionally.

When we consider the rarity of horse remains that have been found in deposits overlying Kansan, Iowan, and Illinoian drifts,

and the apparent fact that all belong to *Equus complicatus*, we may conclude that the numerous species which have been described belonged mostly to the older Pleistocene stages.

Camels are well represented in the collections made in Nebraska and Oregon, and are represented in the Aftonian. We might expect that the group would be represented in the Port Kennedy cave collection, but its presence there is doubtful, and no remains are known to occur in the Pleistocene of Florida. It is possible that the camels had already died out in the eastern part of our country.

On the other hand, no bison are represented in the collections made at Hay Springs, Nebraska, Christmas Lake, Oregon, and in the Oregon Desert, as shown by Matthew's lists (Bull. Amer. Mus. Nat. Hist., Vol. 14, p. 317). The group appears, however, to be represented in the Port Kennedy collection by a few bones, and a bison occurs possibly in the Aftonian. It looks, therefore, as if the earliest Pleistocene was characterized by the existence of numerous edentates, horses, camels, tapirs, and saber-tooth cats, and few bison, while during the later pre-Wisconsin Pleistocene there were few edentates, few horses, no camels, few saber-tooth cats, but numerous bison.

The writer is inclined to the opinion that the mammalian fauna, discovered in the Aftonian beds of western Iowa, is the equivalent of that found in the Nebraska and Oregon localities referred to above, as well as that of Port Kennedy cave, in Pennsylvania, and, inasmuch as the level of the Aftonian beds is fixed in its relations to the glacial drift-sheets, it seems proper to call the earliest known assemblage of Pleistocene animals the Aftonian fauna. The succeeding fauna, if it shall prove worthy of recognition, may be known as the Sangamon. Some fortunate discoveries in the interglacial deposits known as the Yarmouth, the Sangamon, and the Peorian, may enable future students to characterize accurately this Sangamon fauna. It is the opinion of the writer that the contents of the Conard fissure represent this fauna, but here few of the large mammals have been preserved.

The mammals that are included in the Aftonian and the Sangamon faunas are practically those divided by Professor Osborn into his *Equus-Mylodon* and *Megalonyx* faunas. This division appears to be based on the presence of abundant moisture or the lack of it, producing respectively forested and grass-covered regions. The existing animals of North America have been divided by some writers, into those of the forested region and those of the dry plains;

but Dr. C. H. Merriam has shown that the controlling factor in the distribution of recent animals and plants in North America is temperature (Proc. Biol. Soc., Washington, Vol. 7, 1892, pp. 1-64, pl. 1.; Nat. Geog. Mag., Vol. 6, 1894, pp. 229-238, pls. 12-14). It would seem, too, that if there was ever a time since the beginning of the Pleistocene epoch when differences in amount of moisture would determine the distribution of life in our country, that time is at present.

It cannot, of course, be denied that humidity and drought have their influence on both animals and plants, and that at all times during the Pleistocene the distribution of species of mammals was modified thereby, although this was subordinate to more powerful factors.

It might, therefore, be expected that the Pleistocene faunas recognized here would be a northern and a southern, with, perhaps, an intermediate one and, certainly, we must recognize the presence of arctic, temperate, and subtropical elements in our lists of species of Pleistocene mammals. However, since, through the influence of four or five glacial ice-sheets, the arctic and cool-temperate animals have again and again been driven southward upon the warmth-loving species, and the latter have as many times swarmed far north, and the remains of all that existed at each stage are often mingled in practically the same deposits, it is impossible to base faunal divisions on predilections for a warm or a cold climate.

A factor far more potent in determining modifications of faunas than either moisture or heat is *time*. It never ceases to act and its influence is inexorable. A great assemblage of animals is swept away and another is put in the place of the old, and this is doomed itself to disappear in its turn. The classification of the mammalian faunas of the Pleistocene here proposed, is, therefore, based on the changes supposed to have been wrought by this potent agency.

Had one, however, lived during any of the interglacial stages, one would doubtless, as now, have recognized a number of faunas that occupied zones determined by temperature.

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